

December 26, 1936

This Week

Beginning on page 877, **AUTOMOTIVE INDUSTRIES** presents a picture review of the highlights of the automotive world in 1936.

The procedure for tin plating aluminum alloy pistons is described in detail on page 884.

And now it's a device which automatically attends to lighting and extinguishing the parking lights on your car. The Photo-relay Chilowski does this neat trick. For a description, turn to page 890.

Up-to-the-minute equipment which was recently installed in the Buick axle division is illustrated on pages 892 and 893.

Week's Output Lower

Holiday Closing Cause of Drop in Car Production, Rather than Parts Shortage Resulting from Strikes

By Harold E. Gronseth

Strikes, holiday closing and inventory-taking combined to curtail automobile production this week. The same factors will affect production next week so that the last half of December will not come up to expectations, and output of the industry for the month will fall short of the anticipated 500,000 unit mark, although it will show a good gain over the corresponding month of last year.

Production lost by strikes, however, is less than generally supposed. With important suppliers, such as the glass plants and Kelsey-Hayes Wheel Co., closed by strikes, no car manufacturer

as yet has been forced to suspend operations on this account. Inventories on hand or increased supplies from other sources have permitted those affected to maintain production with only moderate curtailment in some quarters. Many of the companies expect to meet their December schedules. Car manufacturers who lost some time on account of the Midland strike early this month have made up lost production by Saturday operations.

The Christmas holiday this week has shortened the work-week in many cases to 3½ days, with the plants shutting down shortly after noon on Thursday. Some plants will complete the day, and a few departments will operate Saturday, but full production will not be resumed until Monday. One company closed down on Tuesday this week for inventory and will not reopen until after the first of the year. At least one other will probably lose one or two days next week for the same reason.

At least one beneficial effect on the industry will come out of the strikes if they continue so long as to reduce materially car production. If dealers are prevented from filling new car orders promptly, their used car stocks will not mount quite so fast and inventories that must be carried through the winter months will be somewhat lighter. While used car sales have held up well, stocks nevertheless were climbing at a good rate and some feared that dealers might be glutted before the active spring market could come to the rescue.

The effect of strikes now in progress, even if promptly settled, is expected to be reflected on the industry's production for several months and will probably mean a heavier spring output than had been planned. The glass plants require considerable time to attain full production after they resume and it is not unlikely that a glass shortage may be felt for some time after the strike is settled.

Retail sales of Hudson and Terraplane cars in the U. S. for 1936 passed the 100,000 mark Dec. 17, according to W. R. Trace, vice-president in charge of sales.

Union Opens Campaign Against GM

UAW President Requests Collective Bargaining Contract, Lists Complaints in Meeting with Officials

As we go to press, the labor situation in the automobile industry appears to be a little less strained than it was early in the week, when Homer Martin, UAW president, sent a telegram to W. S. Knudsen, executive vice-president of General Motors, requesting a collective bargaining conference.

Martin also sent a letter to Mr. Knudsen and to Alfred P. Sloan, Jr., charging that the present crisis was brought about by "flagrant discharge" of union members in the corporation's plants, "speed up," "lack of job security," and other complaints.

Following a conference Tuesday morning between Martin and GM officials, the corporation issued the following statement:

"A personal interview was granted Mr. Homer Martin, president of the UAW, at which Mr. Martin presented various alleged discrimination cases and grievances outlined in his published telegram and letter.

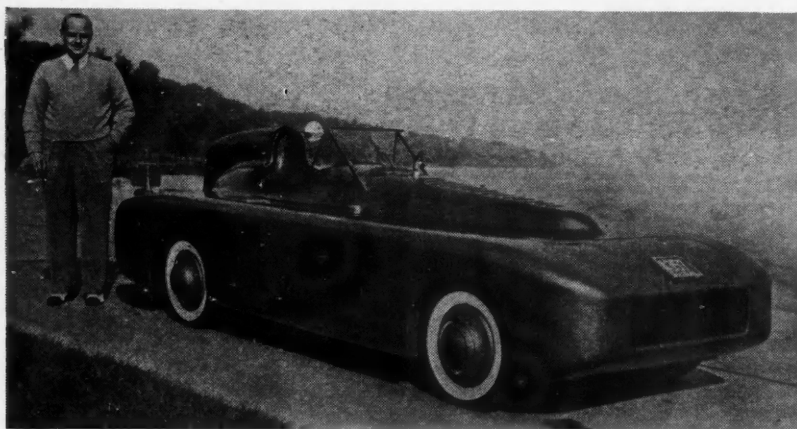
"Mr. Martin was advised to take the various matters up with the plant manager or, if necessary, the general man-

ager having jurisdiction over the location involved, this being in conformity with the corporation's operating policy."

Legal action was started by the Ford Motor Co. Tuesday to secure equipment for the manufacture of brake parts now in the strike-bound Kelsey-Hayes plant. Notice was served by the Ford management on Kelsey-Hayes officials that replevin action was being instituted in order to avoid trouble with strikes in a plant when Ford men are sent in to get machinery. The equipment is to be moved to a Ford factory and put into immediate operation to replenish the company's brake supply.

Basis for settlement of the Kelsey Hayes strike was agreed upon by the company and union leaders Dec. 23. The agreement provided that the company's workers will be granted a 75-cent minimum wage immediately, that there would be no discrimination against strikers and that adjustments on the scale of 75 cents would be made. This is on condition the men leave the plant.

(Turn to page 872, please)



The "Harris Front Drive Special" was built by Benjamin F. Harris, consulting engineer of Chicago, as a hobby during his spare time. It is intended to demonstrate functional and artistic design. Three years were required to design and build the car. Wheelbase of the car is 86 in. and the overall length is 12 ft. It is powered by a specially built V-8 with bore of 2.2 in., stroke of 3 in. and piston displacement of 92 cu. in. Taxable hp. is 15.6 and b.hp. 32 at 3200 r.p.m. Total weight of the car is 1500 lb. and its speed is given as 90 m.p.h. in traffic gear and 110 m.p.h. in speed gear. Only one passenger is carried.

Diesels in Mines

Four European Nations Use Them Because of Safety and Economy

How Diesel engines have invaded the mine-locomotive field in Germany, Belgium and France and are now on trial in Great Britain is described in a Report of Investigations by George S. Rice, chief mining engineer, and F. E. Harris, just published by the United States Bureau of Mines, Department of the Interior.

Mr. Rice visited German mines in 1931 and was impressed with the possibilities of Diesel mine locomotives, which had been first introduced in 1927. In 1933, the Bureau of Mines contemplated their possible introduction in the mines of the United States, if they could pass its tests, and so indicated by issuing one of its recommendatory decisions.

Mines in the four countries named above were again visited in 1935. Rides in trips behind the locomotives and conferences with directors of the official testing stations and with mine operators confirmed earlier favorable impressions.

Two advantages for Diesel mine locomotives over other kinds are claimed by the German, French and Belgian engineers—greater safety and much less cost of haulage. The fuel oil used requires a high temperature for ignition and the combustion takes place only with a high percentage of oxygen present. An essential feature of the design is prevention of flames, that under some abnormal conditions might pass out of the exhaust or out of the intake passages. This is accomplished by "piles" of thin metal plates with small spaces between, similar to flame arresters employed in European electric motors. The exhaust also passes through water

or water sprays to prevent smoke or sparks from passing out into the roadway.

The authors suggest that the favorable reports from European countries as to the safety of Diesel mine locomotives for use even in gassy coal mines and as to their economy in haulage will probably stimulate in this country the

manufacture of types suited to the special conditions that exist in both metal and coal mines. It is probable, however, that before there is a general adoption of them, mine operators and state mining officials will require manufacturers to submit their different Diesel locomotives for official state approval, which would involve their being tested for "permissibility" by the United States Bureau of Mines.

W. A. P. John Succeeds MacManus as Agency Head

Retirement of Theodore F. MacManus as active head of the advertising agency of MacManus, John and Adams, Inc., and succession of W. A. P. John to the presidency of the company, was announced Dec. 19 by the board of directors. James R. Adams, the other founding partner, becomes executive vice-president and general manager. Mr. MacManus still retains an interest in the company. His son, John R. MacManus, becomes vice-president, secretary and director. Harvey G. Luce also becomes a vice-president and director.

The corporate name remains unchanged, and the internal organization changes become effective immediately, Mr. John announced.

Among the principal MacManus clients are the Pontiac Motor and Cadillac Motor Car divisions of the General Motors Sales Corp., and the Champion Spark Plug Co.

Canadian Car Prices Assailed

Tariff Board Hears Consumer Complaints, Manufacturers' Explanations of Higher Costs

Sittings of the Canadian Tariff Board, at Ottawa, Ont., this week and continuous consultations among those who deal with questions of tariff and taxation betoken an early budget this winter, probably not later than the middle of February. The automobile tariff is very much to the fore this year. The whole basis of discussion whenever the subject comes up, is the disparity between the prices of the same type of car in Canada and the United States and even in Canada and Great Britain. Duties and taxes going to the government are a material factor but other differences, accounted for by production costs, fail to satisfy the critics despite elaborate justification by the manufacturers.

An international glass cartel controls and so divides the markets of the world that General Motors of Canada, Ltd., Oshawa, Ont., is denied its full plate glass requirements by the only British plate glass manufacturer, and is so forced to buy most of its supply in Europe, the Tariff Board of Ottawa, Ont., was told in the first session on the automobile reference. Since this made it more difficult for cars manufactured in Canada to contain the stipulated proportion of Empire-made parts,

it acted as a damper on the development of intra-Empire trade, H. J. Carmichael, of General Motors contended.

Protest was also made against the Canadian railways' refusal to equip 2000 freight cars for automobile transport to the Pacific Coast, and it was stated that unless some relief is forthcoming from present freight rates General Motors of Canada would ship cars to Vancouver by ship via the Panama Canal.

Mr. Carmichael, of General Motors, accounted for most of the gross difference of \$148 between the U. S. and Canadian prices on the Chevrolet Master Six coach, and explained that the \$61.88 of the difference unaccounted for was "surplus to the Canadian factory." Against accusations that this amount represented "excess profits," Mr. Carmichael replied that it was really "excess cost" since his company had not made a profit for six years.

R. T. Graham, officially representing the governments of Manitoba and Saskatchewan, styled himself as representing the "forgotten man"—the consumer—and protested that the Ford 1937 price was about \$30 higher, despite tariff changes and contrary to the trend of competing cars. "From the com-

sumer's standpoint it has been extremely disappointing that the tariff board's inquiry of last year did not result in savings to the consumer, although the board expressed its particular interest at that time," he said.

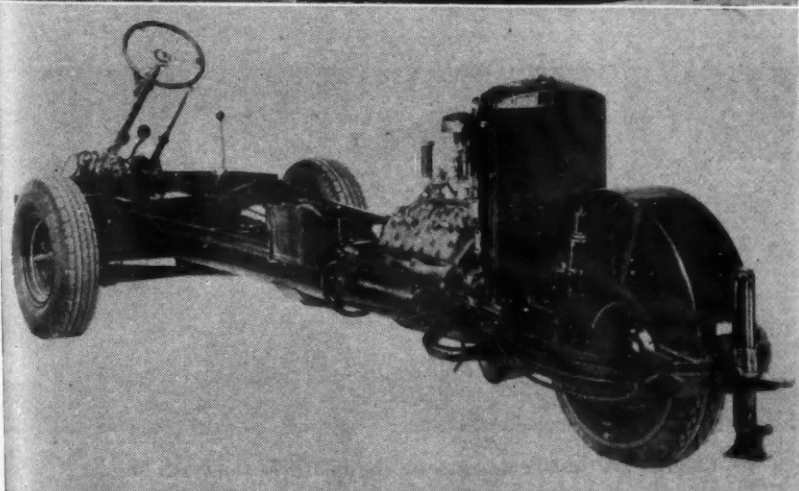
Breaking down Ottawa and Washington prices of a Chevrolet Master Six coach, Mr. Carmichael stated that the list price at the former place is \$830 and the latter, \$625. Canadian Federal taxes amount to \$65.68 while the U. S. Federal tax is \$16.70. That leaves a gross difference of \$99.02. The Canadian dealer gets the same percentage discount as the American, giving a margin to the former of \$183.27 against the latter's \$146.82. The remaining difference unaccounted for is only \$61.88. "I just wanted to correct the impression that \$148 was being extorted from the western farmer for motor vehicles," Mr. Carmichael concluded.

In every General Motors car built in Canada there were this year 266 more pounds of Canadian steel than last year. Five hundred tons of die castings would be purchased in Canada as

well as 2500 tons of gray iron castings. "Our goal this year is to have 68 per cent of our factory cost from the Empire," Mr. Carmichael added.

Regarding Ford prices, H. Roe stated that the Canadian price was up about \$27 but the mark-up was almost the same in comparison with the U. S. price that it was last year which, he contended, was the proper criterion.

A national campaign which is designed to inform the Canadian public of the economic value to the Provinces of the local automotive industry has just been initiated by the Automotive Industries of Canada, a trade association, according to a report to the Department of Commerce from Katherine E. O'Connor, assistant U. S. Trade Commissioner, Ottawa. The campaign has been planned to point out the economic advantages which will accrue through local support of the industry. Payments of wages, purchases of domestic raw materials, tax payments and other disbursements of money by the local industry will be emphasized, the report states.



Front view of the three-wheeled car, built for Arrowhead Springs, shows facility of entrance or exit (above)
Chassis viewed from the left rear (below)

AAA Program Changed

First Los Angeles Race Cancelled, Opening of Track Postponed

Postponement of the March 28 premier of the new Los Angeles, Calif., Raceway, officially approved today, shifts the opening of the 1937 major automobile racing campaign to the Indianapolis Speedway and its 500-Mile International Sweepstakes on Memorial Day.

Change in plans for the nation's second raceway, a counterpart of the Roosevelt Raceway at Westbury, Long Island, which opened last Oct. 12, was brought about by unsettled conditions in Southern California which have resulted in a prohibitive increase of construction material costs, according to the announcement at national headquarters of the Contest Board of the American Automobile Association, governing body of the sport.

When the Los Angeles Raceway would open was not certain at AAA offices, but Capt. Eddie Rickenbacker, Contest Board Chairman, was of the opinion that the new track would be ready for a late fall date.

Postponement of the Los Angeles track's opening will have no effect upon the schedule of the Roosevelt Raceway, Captain Rickenbacker definitely assured. He said the Roosevelt Raceway would present the two major classics already registered on the International Sports Calendar for 1937.

Three-Wheeled Car

Front-Wheel-Drive Vehicle Has Engine in Rear

The accompanying photographs show a "completely streamlined" rear-engined, three-wheeled car built by the Advance Auto-Body Works of Los Angeles for use as a display car by the bottlers of Arrowhead Spring water. The two front wheels are driven from the rear-mounted eight-cylinder engine, and steering is by the single rear wheel. One of the advantages claimed is that the car be turned in a radius equal to its own length. There is room for three passengers in the air-conditioned compartment, where they are said to be immune from annoyance by engine noise, heat and exhaust.

Dodge Adds to Rail Shipping Facilities

The closing of river and lake navigation at a time when car production is proceeding at capacity has increased the demands on the Dodge shipping department to a point making the use of additional freight sidings and loading ramps necessary.

To enable car distribution to keep up with car production, the Dodge management has leased extensive railroad docks located at East Warren Avenue, west of Connor, where part of the daily output is loaded into box cars for transportation by rail.

Automotive Metal Markets

Motor Plants' Steel Needs Covered for Several Weeks;

War Buying Boosts Non-Ferrous Prices

By William Crawford Hirsch

Uneasiness concerning the outlook for industrial peace in the realm of steel as well as automobile manufacturing has relegated to the background for the time being the steel market's interest in the possible effect of the higher first quarter prices on automotive demand. For the bulk of their early 1937 requirements, automobile manufacturers as well as parts makers are covered at old prices. With most of the finishing mills having declared themselves out of the market at these prices, the higher levels are nominally in effect, but what little buying at the advance has materialized is in the aggregate trifling in comparison to the huge tonnage for which mills are committed at old prices and which they are now striving to ship in the next five weeks.

In the non-ferrous metal markets, Europe's war hunger for metals is making itself felt more and more, driving prices higher and higher, to the detriment of American consumers. To some extent, this unhappy state of affairs is also painfully noticeable in the ferrous division of the market. Japan is reported to have purchased 50,000 tons of pig iron this week and several European nations are buying scrap in a market in which scrap iron prices are already abnormally high.

Pig Iron—Shipments to automotive foundries against old contracts continue heavy and some first quarter business at the \$1 per ton advance is reported to have been booked in the Middle West. A significant development is preparations for the re-opening of New Jersey iron mines, which have long been idle.

Aluminum—In response to higher prices in the scrap market, makers of secondary aluminum have raised the price for No. 12 alloys $\frac{1}{2}$ cent per lb. Higher prices for aluminum have gone into effect in Canada.

Copper—Following an advance to 11.60 cents in the price of export copper, producers raised the domestic price of the red metal $\frac{1}{2}$ of a cent to 11 $\frac{1}{2}$ cents. On Dec. 14, the price of copper had been advanced from 10 $\frac{1}{2}$ cents to 11 cents. Some copper products were advanced 1 cent per lb., following the rise in the basic metal's price. As in the case of lead, it was said that one reason for the advance in the domestic price was to discourage all thought of exports, the supply in sight being needed at home. Bull interests in London are talking of still higher prices.

Tin—Uncertainty over what output the International Tin Committee will sanction for the first quarter continues. The matter comes up for consideration by the Siamese government Dec. 26. The market for spot Straits opened this week at 51.90 cents, slightly lower than the preceding week's close.

Lead—A spectacular rise of \$10 a ton greeted lead buyers on Monday, the market becoming quotable at from 6 to 6.05 cents, New York, the highest price since February, 1930. Some consumers are so urgently in need of lead that premiums are talked of.

Zinc—Strong.

Strikers at Kelsey's Windsor Plant Weaken

Sixty-eight men returned to work at the Kelsey Wheel Co. plant in Windsor, Ont., where 140 workers had struck the day before. Plant operations were re-

sumed on a reduced scale, while the remainder picketed outside the employees' entrance. Both sides indicated their willingness to get together and arrive at a settlement. The strikers' requests concern higher wages and better working conditions while they also ask that five men discharged three days ago be brought back.

Union Campaign Against GM

(Continued from page 869)

Union officials agreed to submit these proposals to the men and it was expected that they would accept.

Automobile salesmen in Detroit were being taken into the UAW by a special organizer working with this group and more than 500 have already joined, it was said.

Outlook for settlement of the strike at the Aluminum Co. of America plant in Detroit brightened when the Department of Labor conciliator submitted to strikers a proposal for a minimum wage of 50 cents an hour, an increase of 4 cents an hour for those above the minimum rate and reinstatement of all workers without discrimination. It was predicted that the strikers would accept these provisions if the company agreed to them.

Sitdown strikers at the Kansas City plants of Fisher Body and Chevrolet voted to leave the plant and shortly after noon, Dec. 23, some 500 men withdrew, thus paving the way for settlement of the strike. The status of the strike situation at Atlanta plants remained unchanged.

Employees of the National Automotive Fibre, Inc., returned to work under a truce pending completion of negotiations.

Official notice of the situation was taken Tuesday by Secretary of Labor

Frances Perkins, when she pledged the Labor Department to exert all its efforts to prevent outbreaks of strikes in the automobile and steel industries.

Activity of the UAW in General Motors plants and the request of its officials for a conference with corporation executives prompted Mathew Smith, secretary of the Mechanics Educational Society, to address a letter to officials of Fisher Body and of the GM research division requesting that his union be recognized as the collective bargaining agency for workers in these units.

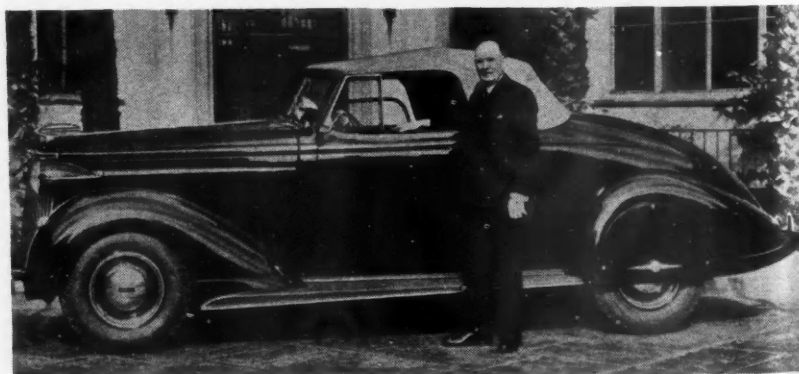
"We have no demands to make," said Mr. Smith, "but it was necessary for us to go on record in view of what the other organization is doing. We are having no trouble at all with General Motors, and we have always found their officials ready to meet with us when we could show that we represent a majority of the workers."

Smith claims that 78 per cent of the skilled workers in the Detroit plant of Fisher Body and 99 per cent of the GM research and experimental workers are members of the MESA.

:SLANTS:

BACK-FIRE—Inventors of the now world-wide sitdown technique of striking learned this week how it feels to be on the receiving end of such a move. Five office girls, employed at the headquarters of the Goodrich local, United Rubber Workers Union, in Akron, staged a miniature sitdown for higher wages and in protest against too much overtime work. They won. Two additional workers were employed, salaries adjusted, and the 30-hour week instituted with 50 per cent extra pay for overtime.

GROCERIES—Administrative and Research Corp. of New York remarks: "If you hear that some of our major oil companies are going into the chain grocery line, you can charge it to the trailer rage which has compelled many filling stations to carry canned and package foods."



Charles W. Nash, chairman of the board of the Nash Motors Co., stands beside a Nash Ambassador Eight cabriolet. This type of body is now being built on all three Nash-Lafayette series, and is priced at \$740 for the Nash-Lafayette "400" model.

Emile E. C. Mathis, French automobile manufacturer, and his wife beat off holdup men who attempted to steal Mrs. Mathis's jewelry in New York. The picture was taken when they arrived on the Normandie last month.



International News ph-40

Mathis Attacked in N.Y.

French Car Maker and Wife Beat Off Holdup Men

Emile E. C. Mathis, French automobile manufacturer, and his wife were attacked by holdup men as they were leaving a taxicab in front of the Hotel Plaza in New York early on the morning of Dec. 21. Mr. Mathis came to grips with one of the men and rolled on the sidewalk with him while Mme. Mathis screamed for aid. The streets were deserted and no help came, but the bandits became frightened after a few minutes and escaped in their car. The taxicab driver, who had looked on during the struggle, is reported to have explained: "I'm not trying to be no hero."

Mr. and Mrs. Mathis came to this country last month and after spending a few weeks in Detroit returned to New York. The evening before the attack they had had dinner with a party of friends, among whom were Byron C. Foy, president of the DeSoto Motor Corp., and Mrs. Foy, who is a daughter of Walter P. Chrysler, chairman of the board of Chrysler Corp.

Mrs. Mathis had been warned against wearing her famous jewels, one a magnificent emerald and diamond necklace, while in New York. The day after the attack she said that she would send her gems, reported to be worth about \$500,000, back to France so as to be able to enjoy the remainder of her stay in New York.



ROBERT H. MULCH, former General Motors and Chrysler sales executive, has been appointed general manager of the trailer division of the Hayes Body Corp., Grand Rapids, Mich. Mr. Mulch was also vice-president and general manager of Durant Motors.

WALTER N. STANCATI has joined the staff of the Foxboro Co., Foxboro, Mass., makers of industrial precision instruments and will work out of the Pittsburgh office.

HENRY H. ROBERTS has been appointed legal and legislative counsel of the National Automobile Dealers Association, it was announced by Arnon N. Benson, general manager.

Dealers Welcome New Price Policy

No Harm to Sales Seen in Higher Advertised Prices for Cars and Discounts Will Not Be Affected

No one seems to regret the passing of the f.o.b. price advertising in the automobile industry. Pressure from the Federal Trade Commission enabled the industry to take a step that, all agree, should have been taken years ago, but which only tight competition prevented. At various times in the past, individual companies made courageous attempts to substitute delivered prices for the traditional in their advertising but they were forced to discontinue when the rest of the industry failed to follow.

Dealers on the whole welcome the move, since the elimination of fictitious low list prices relieves them of considerable explaining to customers who frequently attempted to dissect the wide differential between the advertised price and the amount they actually had to pay on delivery. Now the customer needs only to add freight charges from factory to point of delivery and local taxes to the advertised price to arrive at his cost.

"I think it is a fine thing," said A. N. Benson, general manager of the National Automobile Dealers Association. "It is what we have suggested, recommended and wanted for a long time."

The association started agitation for "delivered price" advertising several months ago, finally bringing into the picture the Better Business Bureau and the Federal Trade Commission.

The new policy will not affect dealer discounts which will continue to be based on the factory list prices, nor will there be any change in billing. The intention is to leave profit margins undisturbed. Conditioning and handling charges which the dealer formerly added will be included in the new "delivered price at point of manufacture." Of necessity these charges will have to be uniform for all dealers handling a given make of car.

It is not improbable that some dealers, under the old plan, collected more than will be allowed in the uniform "pack" included in the new prices at the factory. Such dealers may sacrifice some of their old gross profit which was

obtained that way. It will not be convenient for them to inflate the "pack" beyond the amount allowed by the factory and included in the new price, but there is no law to prevent dealers adding other charges if they can explain them to the satisfaction of the customer or even bury them in the freight charge.

General opinion among manufacturers and dealers is that the new price policy will not hurt sales. The theory of a low list price was that it brought customers into the showroom that otherwise would not come in. But few in the industry now put much stock in that theory. Present day buyers are usually well informed and do not fall for that old trick. They always expect the dealer to add something to the f.o.b. price but it was the amount sometime added that shocked the prospect and at times discouraged the sale so that the old price policy did about as much harm as good in promoting sales.

One official predicts that next year the factories will have only one set of prices which will be the "delivered price at point of manufacture" and that dealer discounts will be adjusted to the new basis, with the old f.o.b. completely out of the picture.

Following the AMA announcement, the Ford Motor Co. issued a statement to the effect that on Dec. 3 it had adopted the policy of eliminating all "f.o.b." and "factory list" prices from advertising effective throughout the United States. The new method would not affect in any way delivered prices to the dealer or public. Any prices stated in factory advertising will be the delivered price at Dearborn, Mich., without taxes.

The new price policy has long been advocated by AUTOMOTIVE INDUSTRIES. An article in the issue of Feb. 17 recommended such a change, stating: "With NRA in the picture it is now possible to rationalize these policies which, perhaps, could not have been done legally in the past." Since the only variable item is freight, the advertised price should include all others, it was stated.

Young Spring & Wire Builds Eastern Plant

The L. A. Young Spring and Wire Co., of Detroit, which manufactures wire springs for automobile upholstery and other wire products, is expanding its business by the erection of a \$500,000 eastern plant in Trenton, N. J. The building will be completed early in April. Approximately 600 men will be employed at the start.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for AUTOMOTIVE INDUSTRIES

A high rate of business activity was maintained last week. The business index of the "Journal of Commerce" stood at 100.7, as against 100.3 for the week before and 84.5 for the corresponding week last year. Retail sales were estimated from 15 to 30 per cent above those in the corresponding period last year.

Carloadings Show Slight Decline

Railway freight loadings during the week ended Dec. 12 amounted to 738,747 cars, which marks a decline of 6210 cars below those in the preceding week, a gain of 122,097 cars above those a year ago, and a rise of 158,545 cars above those two years ago.

Chain Sales Well Above Last Year

Sales of 27 store chains, including two mail order houses, during November were 11.3 per cent above those in the corresponding period last year. During the first 11 months of this year sales of these same companies were about 14 per cent above those in the corresponding period last year.

Food Prices Little Changed

The retail cost of food from Oct. 13 to Nov. 17 declined 0.4 per cent, according to the Bureau of Labor Statistics. The current index stands at 82.5 per cent of the 1923-25 average and is 1.2 per cent above that at the corresponding time last year.

Power Output at High Level

Production of electricity by the electric light and power industry in the United States during the week ended Dec. 12 was 14.9 per cent above that in the corresponding period last year.

More Building Than Last Year

Construction contracts awarded in 37 Eastern states during November, according to the F. W. Dodge Corp., amounted to \$208,204,200, as compared with \$225,767,900 the month before and \$188,115,000 in the corresponding period last year.

Fisher's Index

Professor Fisher's index of wholesale commodity prices for the week ended December 19 stood at 86.7, as compared with 86.6 the week before and 87.3 two weeks before.

Federal Reserve Statement

The consolidated statement of the Federal Reserve banks for the week ended Dec. 16 showed an increase of \$2,000,000 in holdings of discounted bills. Holdings of bills bought in the open market and of government securities remained unchanged. Money in circulation increased \$55,000,000, and the monetary gold stock rose \$16,000,000.

with motor manufacturers recently in Chicago, anticipates very few alterations to the rules for 1937. The manufacturers announced that there would be no curtailment in racing motor production next year and the same five classes will be retained, Midget and Classes A, B, C and F.

Alvan Fuller Will Celebrate 30th Anniversary as Dealer

Believed to be the oldest distributor or dealer in point of service continuously with any automobile company, Alvan T. Fuller, Boston, former Governor of Massachusetts, will celebrate his 33rd anniversary as New England distributor of the Packard Motor Car Co., Dec. 30. Mr. Fuller was a successful retailer of bicycles when the horseless carriage was in the process of development in this country. He added the sale of automobiles to his business in 1903 when the Packard company was making a single cylinder vehicle at Warren, Ohio.

Commercial Credit to Finance Willys

Commercial Credit Corp. has been given a contract to finance the purchase of Willys cars, it has been announced. Ninety new Willys distributors have signed during the past six weeks, according to David R. Wilson, president, of Willys-Overland Motors, Inc.

40 Years Ago

—with the ancestors of
AUTOMOTIVE INDUSTRIES

Foreign Notes

The Grand Duke Vladimir, general-in-chief of the Russian Army, is now in Paris studying the motor in its bearing on the transport of artillery and supplies in the field.

The annual Salon du Cycle in the Palais de l'Industrie, in Paris, is more than ever distinguished by its exhibit of motor vehicles of all kinds, a fact which has caused some little feeling of jealousy on the part of the cycle manufacturers, and will doubtless necessitate a separate motor exhibition in the future.

Emile Mors shows two carriages at the Paris Salon, for two and four persons respectively, both propelled by gasoline motors. The motor used on the larger of the two carriages is of particular interest. It is of 6 hp. and has four cylinders standing in pairs at an inclination of 45 degrees, thus almost eliminating vibration. By the use of radiating ribs so little water is required to cool the cylinders that a tankful will last an entire day. Electric ignition is employed and the current is furnished by a small dynamo. Leather belting is the form of transmission used. The carburetor is a special one invented by Mr. Mors and is entirely automatic in action.—From *The Horseless Age*, December, 1896.

AMA Prepares for ICC Freight Rate Hearings

Traffic executives of factories, members of the Automobile Manufacturers Association, completed in Detroit last week plans for appearing at hearings before the Interstate Commerce Commission that would affect the rail freight rates on automobiles shipped for export to New York, New Orleans and other American and Canadian ports. The commission has set hearings at New Orleans, Jan. 21.

This complicated rate situation has kept the matter almost continuously before the commission in recent years and notwithstanding several decisions by the commission, an adjustment satisfactory to the several ports and to the shippers has not been reached.

The rates published by the railroads following the commission's last decision were much higher to New Orleans than to New York and would have closed the port of New Orleans to the routing of automobile exports.

The contention of the shippers has been that rates to New Orleans should be on a parity with the rates made to New York, St. John, N. B., and other eastern ports.

The traffic executives were interested

in the length limits allowed under the several state laws for tractor-semi-trailer units such as used for hauling automobiles from factories to dealers. These limits vary from 35 ft. to 50 ft. in most states. The meeting endorsed a movement for an allowance not less than 45 ft., such as is allowed in most states for truck and trailer combinations.

Motor Boat Racing Groups to Plan Regatta Schedules

Meetings of two racing groups, the National Outboard Racing Commission and the American Power Boat Association Racing Commission, have been scheduled in New York during the National Motor Boat Show next January, it has been announced by Charles F. Chapman, racing commissioner.

The outboard commission will hold a rules session on Jan. 12 and the A.P.B.A. commission will line up next summer's regatta schedule on Jan. 14. Several other racing organizations, including the Eastern Intercollegiate Outboard Association, Regatta Circuit Riders Club and Middle Atlantic Outboard Association, will meet during the show from Jan. 8 to 16.

The outboard commission, which met



The new line of simplified Smootharc welders, developed by the Harnischfeger Corp., Milwaukee, Wis., is fully described in a bulletin that has just been released.*

"Speed Control At Work" is the title of a booklet which has just been brought out by the Reeves Pulley Co., Columbus, Ind.*

A new eight-page bulletin illustrating and describing the improved Mixflo centrifugal pump has been issued by the Worthington Pump and Machinery Corp., Harrison, N. J.*

The story of the development of indirect illumination is covered in an attractive booklet being distributed by Silvray Lighting, Inc., Long Island City, N. Y.*

*Obtainable from Editorial Department, AUTOMOTIVE INDUSTRIES, Address Chestnut and 56th Streets, Philadelphia, Pa.

November New Car Sales Estimated at 220,000

November sales of new passenger cars in the United States total 147,589 in the 34 States reported in the R. L. Polk & Co., weekly statement on registrations.

This figure constitutes a percentage gain of 28.50 over October sales, which totaled 114,859 for 34 States. It is also a gain of 1.33 per cent over November of 1935 when 145,657 registrations were recorded in 34 States. The Polk estimate of November sales is 220,000.

Registration reports for 35 States on trucks and commercial cars show 16,970 sales. The November estimate on trucks has been placed at 28,000. Truck sales reported today represent a percentage of minus 20.05 per cent compared to the same month last year when 21,225 sales were recorded, and a percentage of minus 31.99 per cent compared to sales in October when registrations reached 24,953 for 35 States.

Charles L. Bockus

Charles L. Bockus, who retired a few weeks ago as production superintendent of the chassis division of Studebaker Corp., died of a heart attack Dec. 17 in Detroit. He was 68, and had been with Studebaker 20 years. Prior to the recent reorganization he was a director of the corporation.

DuPont Synthetic Rubber To Be Called "Neoprene"

The word "neoprene" has been adopted as a generic term for the chloroprene polymers formerly sold by E. I. duPont de Nemours & Co. under the trade mark DuPrene, the company announces in a letter to rubber fabricators and other users of the product. This action is taken in order to pro-

vide manufacturers with a name which can be applied both to the unvulcanized material and to the products made from it, corresponding to the accepted usage of the word rubber, the letter says.

The new name neoprene will not be trade marked and may be freely used by rubber manufacturers to describe products which display the distinctive characteristics of this unique material. The company states that no change in the product has been made and that adequate steps will be taken to popularize this new name with the consumer public.

Labor Accession Rate High In Automotive Industries

Automobile and body plants showed the highest labor accession rate during the month of October, 1936, of any of the 16 industries reporting these figures to the Bureau of Labor Statistics, Department of Labor. The automotive rate was 16.85 per 100 employees compared with the average of 4.83. Total separations for all industries were 3.25 for the month, while automobile and body plants reported a rate of 3.90 and automobile parts factories, 3.84.

Detailed figures for the automotive industries, as reported by the Bureau of Labor Statistics, follow:

Class of Rates	Turn-over Rates per 100 Employees		
	Oct. 1936	Sept. 1936	Oct. 1935
Automobiles and Bodies			
Quit	1.74	1.24	1.19
Discharge	0.31	0.23	0.26
Lay-off	1.85	3.10	2.39
Total separation ..	3.90	4.57	3.84
Accession	16.85	20.35	19.19
Automobile Parts			
Quit	1.91	1.46	1.35
Discharge	0.53	0.39	0.42
Lay-off	1.40	3.36	2.13
Total separation ..	3.84	5.21	3.90
Accession	12.93	10.72	12.94

Calendar of Coming Events

SHOWS

National Motor Boat Show, New York, Jan. 8-16
First International Consumers' Petroleum Exposition, Detroit.....Jan. 16-24
Automobile Show, Berlin, Germany, Feb. 20-March 7
Illinois Automotive Ass'n, 4th Annual Show and Maintenance Exhibit, Navy Pier, Chicago.....Apr. 24-28, 1937
Second Annual Automotive Maintenance Show, San Francisco...May 20-23

CONVENTIONS AND MEETINGS

Tin Can Tourists' Homecoming, Arcadia, Fla.Dec. 28, 1936-Jan. 3, 1937
S.A.E. Annual Meeting, Detroit, Mich., Jan. 11-15, 1937
American Road Builders Association, Highway Exhibit and Convention, New OrleansJan. 11-15
Tin Can Tourists' Winter Convention, Clearwater, Fla.Jan. 29-Feb. 8, 1937
Tin Can Tourists' Winter Convention, Sarasota, Fla.Feb. 8-14, 1937
Association of Highway Officials of No.

Marmon Truck Line

New Models Feature Ford V-8 All-Wheel-Drive Chassis

The 1937 line of Marmon-Herrington all-wheel-drive trucks and truck-tractors has just been announced from the company's factory in Indianapolis. Latest addition is the all-wheel-drive 1937 Ford V-8 on the 112-in. wheelbase light delivery or passenger car chassis. Built into these units are a driving front axle, truck clutch with four-speed transmission, transfer case and a three point spring suspension. In combination with the standard four-speed transmission, the auxiliary transmission gives a total of eight speeds forward and two speeds reverse.

The 1937 Ford V-8 truck is the third consecutive model which has been made available as an all-wheel-drive unit. New models include four four-wheel drive units and two six-wheel drive units, all of which are offered in two tire sizes. Factory list prices of these all-wheel-drive Ford V-8's begin at \$1,375.

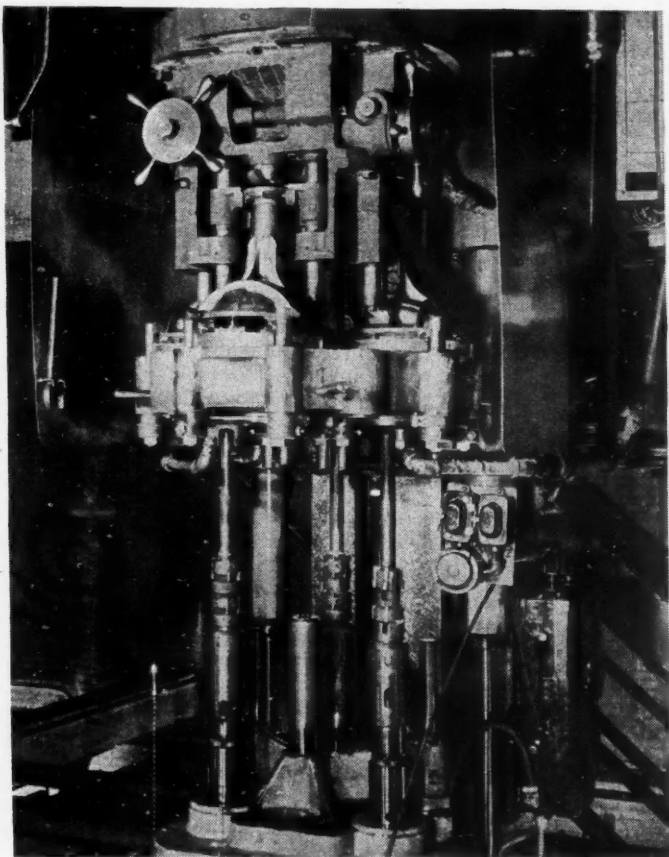
Marmon-Herrington also offers its "C" series of four and six-wheel-drive units, these models comprising the company's heavier duty line which has been produced for a number of years. In regular production are 12 four-wheel-drive models ranging in capacity from two to ten tons and seven models driving through all six wheels and ranging in capacity from seven to 20 tons.

All models have auxiliary transmissions of either two or three speeds forward and standard transmissions of either four or five speeds forward. Power is supplied by heavy duty six-cylinder engines ranging from 78 to 180 hp. Westinghouse air brakes are standard equipment on some models while other models have brakes which operate hydraulically on all wheels. List prices of the "C" models begin at \$2,490.

Atlantic States, 13th Annual Convention, New YorkFeb. 24-26
International Association for Testing Materials, Second International Congress, London, England, April 19-24, 1937
American Society for Testing Materials, 1937 Regional Meeting and Committee Week, Palmer House, Chicago, March 1-5
41st Annual Convention and Exposition of the American Foundrymen's Association, Milwaukee, beginning May 2, 1937
American Petroleum Institute, Mid-Year Meeting, Colorado Springs, Co'o.June 1-3
Second World Petroleum Congress, Paris, FranceJune 14-19

CONTESTS

Indianapolis Speedway, 500-Mile International SweepstakesMay 31
Pan American Cup Race, Roosevelt RacewayJuly 5
Roosevelt Raceway, 400-Mile George Vanderbilt Cup Sweepstakes....Sept. 6
Los Angeles, 500-Mile International SweepstakesNov. 28



One of a battery of Baker boring machines used at Buick. This machine is used for boring differential carriers.

Automatic Transmission

An automotive man from California drove in the other day to demonstrate a novel automatic transmission which utilizes a practically conventional gear box. We drove this job and found its operation very interesting. So far as it is possible to give a word picture of a complex mechanism we might say that the unit consists of a conventional gear box with three clutches built-in. The main clutch is fully centrifugal so that no clutch pedal is required for its operation. Directly back of the main clutch is an independently mounted cone clutch which is used to produce optional second at any time. This clutch must be positively engaged by means of a foot button and must be held down in place for the duration of its use. The third clutch is of multiple-disc construction and it, too, is centrifugally operated. Usually the clutch produces just two speed changes, a "first" when the main clutch comes in, and a direct ratio produced by the entry of the multiple-disc and clutch which comes in between 17 and 20 m.p.h. However, four speeds are available with the temporary use of the optional clutch since it provides a low reduction for fast take-off and a correspondingly higher intermediate re-

duction if the pedal is held down when the third clutch comes in at 20 m.p.h. Here is a rather interesting development which will be presented to the industry some time very soon. We expect to publish an illustrated description of this automatic transmission in *AUTOMOTIVE INDUSTRIES* in the near future.

Plastic Parts

A little note in the current issue of the *Durez Molder* suggests that plastics of various kinds deserve further attention for many car interior details, at present made from various metals. Among other things, Durez suggests a study of plastic applications for many accessories—pump parts, defrosters, heater housings, antenna insulators, bus seat arms, wiring connections, etc. It's well worth more investigation.

Tractor Problem

Just within the year, Allis-Chalmers has cleaned house for volume production of industrial and agricultural tractors on a national scale. How to merchandise a new low-priced line so as to reach farmers all over the country was

Production Lines

a problem of prime importance. Suffice it to say that the Allis-Chalmers message was spread to passenger car dealers all over the United States through dealer publications. And that this drive produced no less than 500 good automobile dealers who found the tractor trade a very attractive business. Indeed, to some dealers this business may result in more profit than their passenger car trade.

Buy Early

Do your Christmas shopping early may apply with equal force to the buying of machine tools for the 1938 season. At least that's the opinion of certain machine tool sales managers. For the first time in years, machinery manufacturers have been so pressed for deliveries that in some cases they have been forced to sacrifice the patronage of many good customers. Their plea is—get your B/P's and bids out right away and give the machinery people time to get set and plan production during the period when their business usually slackens. We submit that this sounds like mighty good advice.

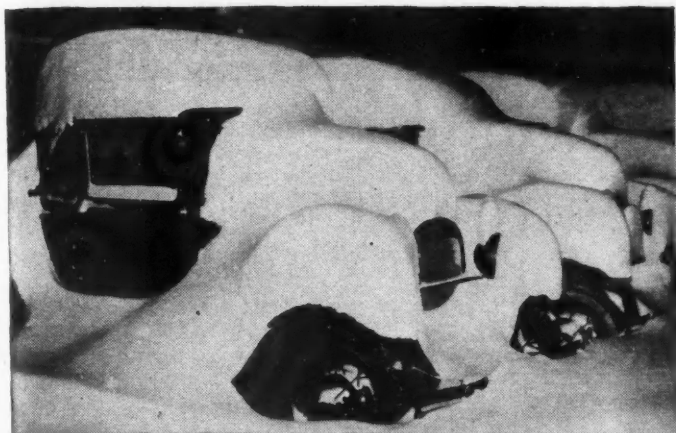
For Tractors

One of the prominent tractor builders is really set to go places next year. They are setting up a new tractor plant, and we saw a few items of new equipment now in process of erection for this plant. We can assure you that these machines will vie with anything that has been designed for motor car production.

—J. G.

Available publications sometimes mentioned on this page will henceforth be found regularly under "Publications Available." See page 875 in this issue.

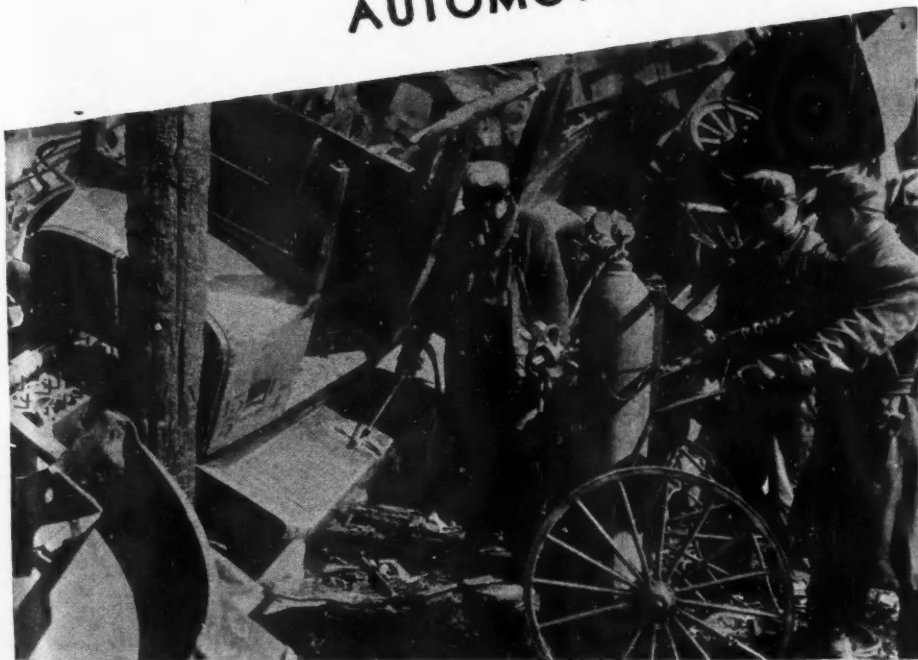
MANUFACTURING
MANAGEMENT
METALLURGY



BLIZZARDS raging over U. S. in January had depressing effect on automobile sales. Curtailment of retail demand was reflected in prompt retrenchment of factory operations. Finished cars piled up as truck haulways all but stopped for weeks. Late in February winter relinquished its frozen grip on important market areas and delivery reports showed sharp upswing.



CAMERA 1936 Re-Views OF THE AUTOMOTIVE INDUSTRY



SAFETY campaigns got underway at the outset of the year as many groups pooled efforts to cut down traffic accident toll.

USED CAR stocks piled up in winter months and seemed to threaten continued prosperity of the industry. Emergency programs to relieve situation eased off early in February with revival of spring demand.

JUNKING PLAN

of Chevrolet Motor Co. established \$1,000,000 cooperative used car fund. For immediately scrapping every old automobile accepted in trade, the company agreed to reward the dealer with \$20. Other leading automobile manufacturers adopted similar schemes.

Underwood & Underwood and Keystone photos

Thousands Back to Work • 300,000 Tractors



TRACTOR sales bettered the high level attained in 1935. Improved models provided as standard equipment: self-starters, head-lamps, spotlights, rubber tires, multiple-speed transmissions, and even radios. This year's production is estimated at over 300,000 units.

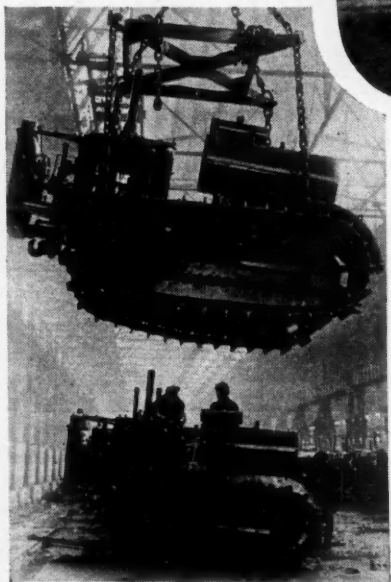
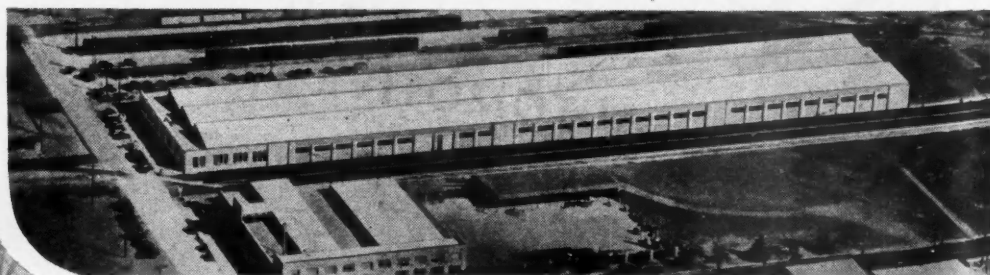
Caterpillar and Domet photos



WORKERS

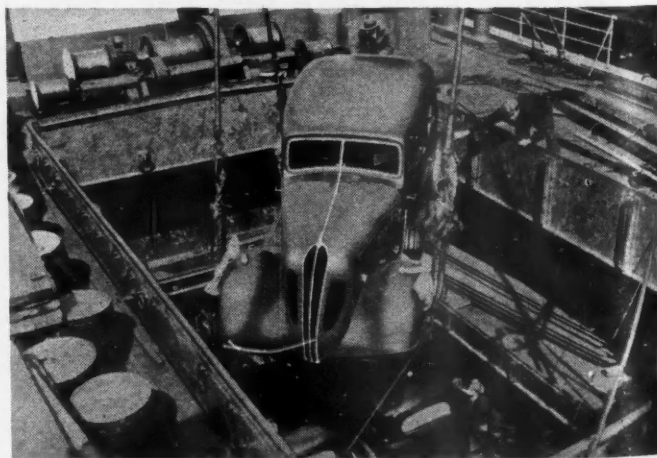
by the thousands found jobs as spring brought record-breaking production activity. Industry's effort to stabilize employment was aided by fall new model introductions. Advance building of inventories of parts and sub-assemblies during normally slack periods played significant role in the bright employment picture of '36.

U.S.S.R. pushed tractor production to new high. One of the Soviets' largest plants, the Cheylabinsk Tractor Works in the Urals (shown below), alone produced about 29,000 units this year.



EXPORT

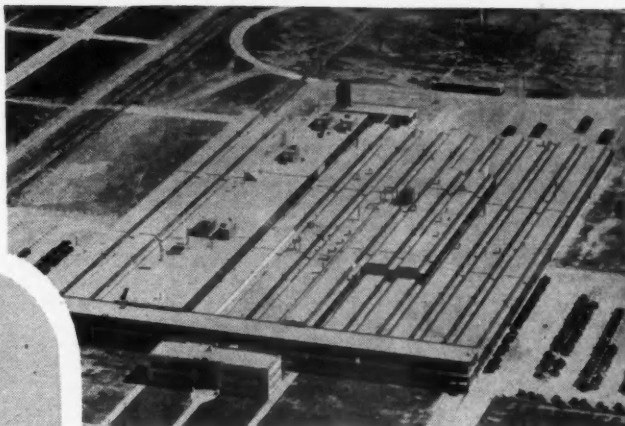
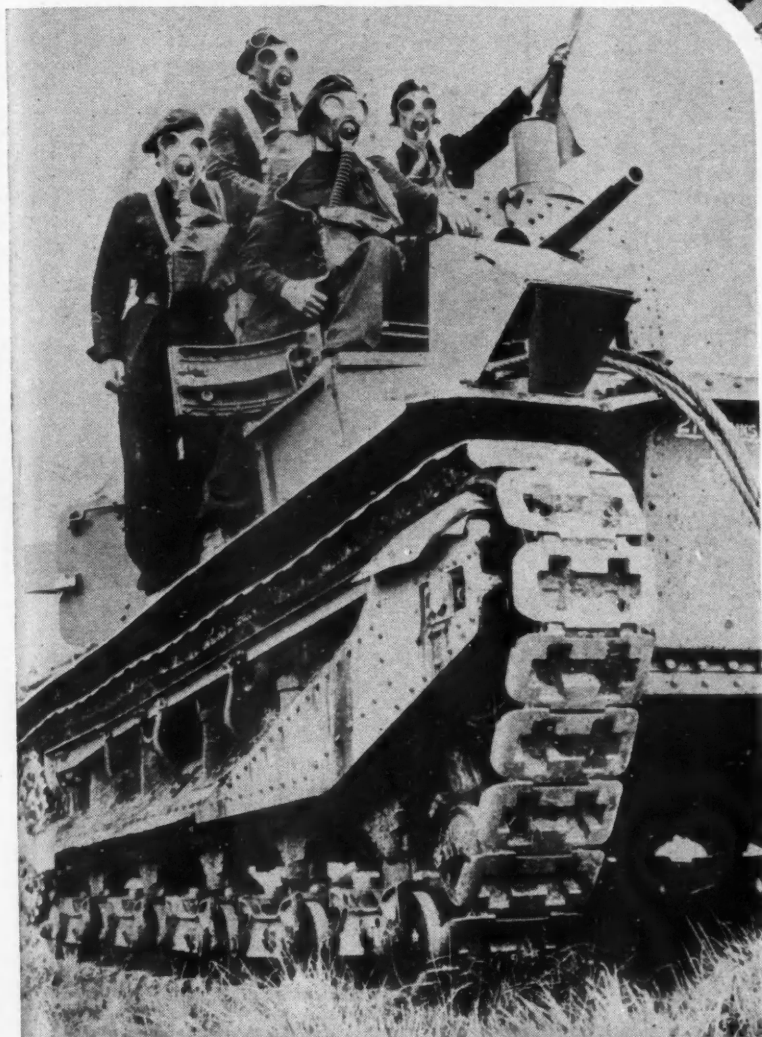
shipments of American motor vehicles, parts and accessories increased under impetus of international reciprocal tariff agreements. Overseas shipments of automotive equipment grossed \$190,217,962 for first ten months of 1936.



World Armies Mechanize • Trailers Captivate Public

ARMIES the world over stepped up programs of mechanization. Nations appropriated additional billions to increase mobility of their rapidly growing "defense" forces. Picture below shows British "Tommies" riding one of England's newest tanks in recent maneuvers.

International photo



NEW PLANTS were built in many parts of the country. In Los Angeles the new Studebaker factory (shown on opposite page) was further expanded. In the same city General Motors completed construction of a factory with a capacity of 50,000 cars per year. (Above.)

TRAILER COACHES really began to find their place in the sun in 1936. Automobile manufacturers, alert to the market possibilities, joined the swelling ranks of fabricators of "houses on wheels." Production programs doubled with quota this year expected to hit 30,000.

UAW International Union launched intensive drives for members with announced determination to raise membership to 100,000 mark by August, 1937. Union officials, shown below, perked up when probationary period by the A. F. of L. was ended and the C.I.O. aligned with the International. (Left to right: Wyndham Mortimer, Edward Hall, Homer Martin, Walter N. Wells and George Addes.)

JAPAN made "overnight" bid for a place in the automotive industrial scheme as its heavy industries, encouraged by new motor control law and governmental subsidies, turned to automobile production. Photo at lower right shows Datsun bodies passing air brushes at Nissan Jidosha Kaisha plant.



Plants Modernize • Best June for AMA Members

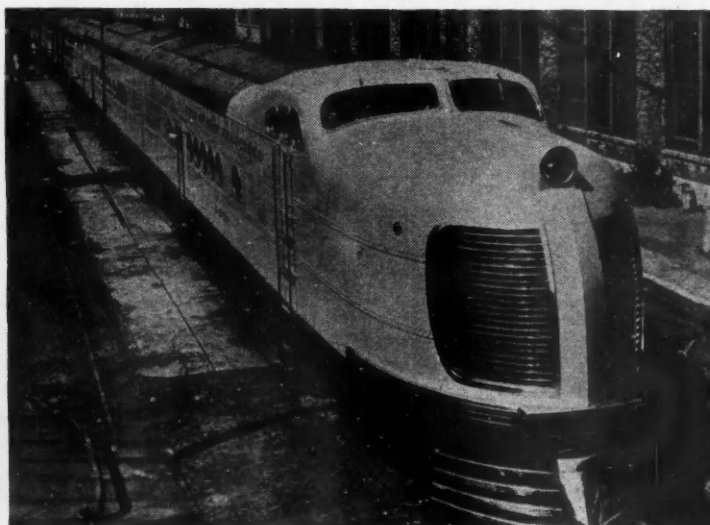
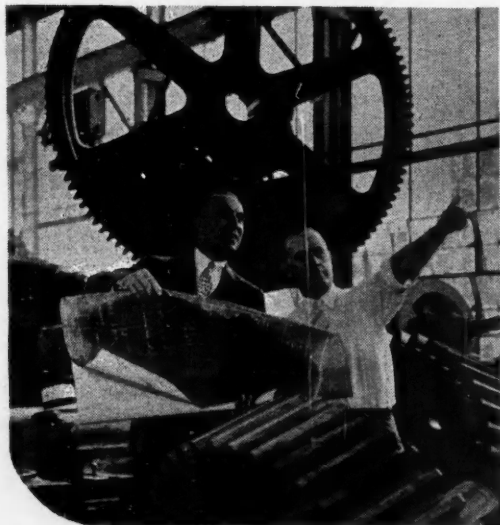
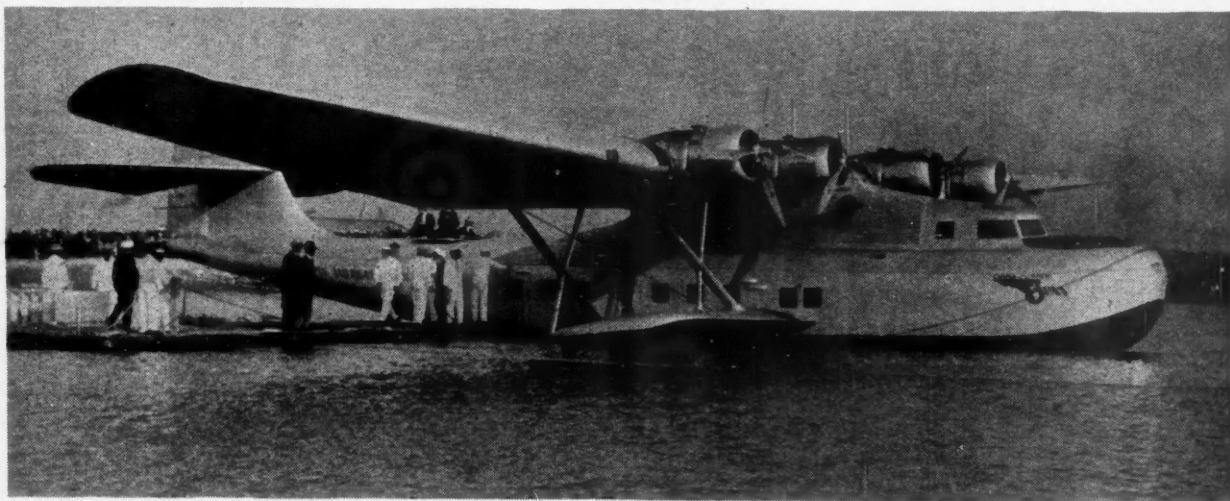
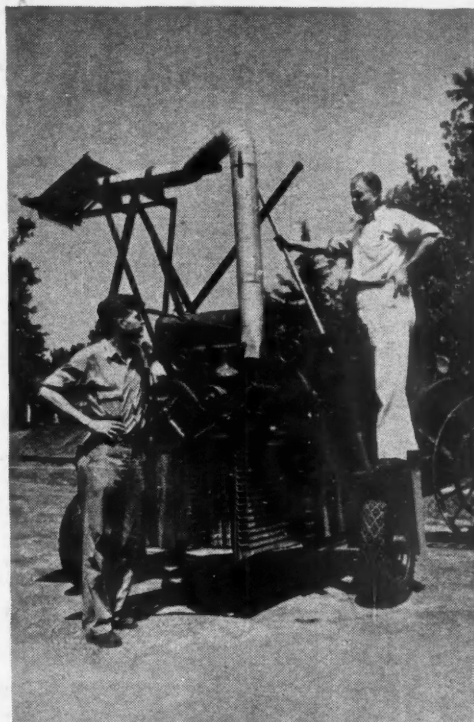
COTTON picker invented by John and Mack Rust introduced. Will this prove to be as revolutionary an advance in the mechanization of agriculture as Cyrus H. McCormick's reaper of a century ago?

TRANSPACIFIC passenger service was inaugurated Oct. 21 when the China Clipper left Alameda, Calif., airport for Manila on its first commercial flight.

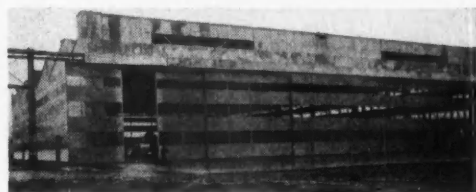
MACHINERY and new equipment for the DeSoto, Buick, Oldsmobile, Pontiac, Packard, and Fisher Body plants alone accounted for a capital investment of \$62,500,000. Photo at lower left shows new presses being installed in DeSoto plant.

DIESEL engines came into more general use for propulsion of high-speed, streamlined trains. When the new plant of GM subsidiary, Electro-Motive Corp., went into production it had on hand orders for more than \$3,500,000 worth of railroad power units.

International and Pictures, Inc., photos



New Factories Built • Truck Sales Hit New High



International and Pictures, Inc., photos

JUNE SHIPMENTS by AMA members reached an all-time record of 367,303 units. Sales held steady all summer as Mr. and Mrs. Public went places on the rising tide of prosperity. Witness the above typical Sunday scene at Jones Beach, L. I.



HEAT WAVE that baked the Middle West for weeks threatened to close factories in July. Salt tablets were dispensed to workers to reduce number of prostrations. (Top, right)



BOMBERS are now being produced at the new Boeing Aircraft Co. assembly building located across from Boeing Field, Seattle, Wash., which was completed and placed in service this year.

CORN BELT power conference held in September at Peoria, Ill. Photo shows field demonstration of two- and five-gang plows drawn by tractors.

TUNNEL under the Hudson at Manhattan's 34th Street neared completion and plans were drawn for a tunnel under the East River to connect with Long Island highways.

TRUCKS enjoyed the best year's sales in their history—total for the year is estimated at 620,000. A day's production awaits drive-away from one of Detroit's biggest factories. (Lower, right)



More Pay for Labor • Sitdown Strikes Start



FOREIGN motor vehicle output increased generally. At the left is a view of the forge shop of the Stalin plant in Moscow which celebrated its fifth anniversary in October. It is reported that the yearly production program at this factory is to be increased to an output of 70,000 three-ton trucks and 10,000 five-passenger sedans.

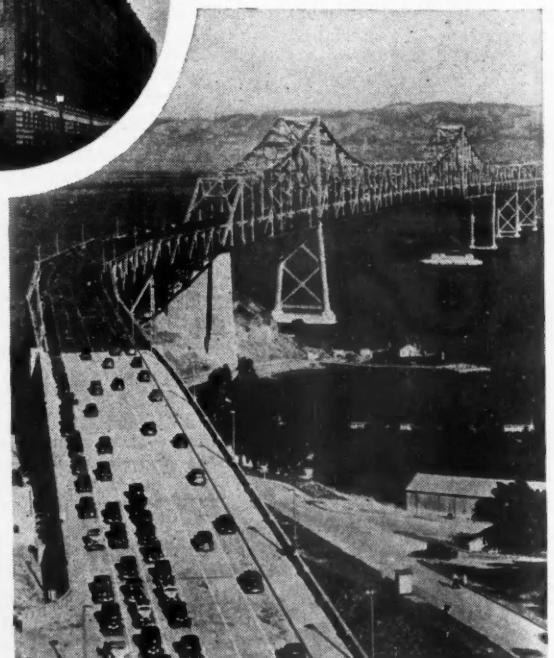
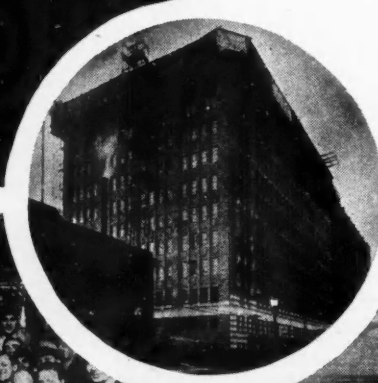
STRIKES in suppliers' plants threatened to interfere with automobile production rates as the year drew to an end. Sit-down strike at Bendix South Bend plant was a lark for the workers as is evidenced by the picture below. The Midland Steel strike tied up Chrysler plants for a few days, but the greatest menace was from the flat glass workers who had succeeded in cutting off 80 per cent of the supply of safety glass used by the automotive industry.

ROAD RACING was revived in the U. S. when foreign entrants came off victorious in the 300-mile Columbus Day grind on the newly built Roosevelt Raceway on Long Island.

LABORATORY facilities were extended by the addition to the General Motors research building. (Circle) Construction of the new GM eastern assembly plant at Linden, N. J., neared completion at the year end.

BRIDGES completed during the year include the San Francisco-Oakland span (shown below), New York's Tri-Borough and Hendrik Hudson bridges.

Sovfoto and International photos



'37 Models Shown • Registrations Soar to Record



Underwood and Underwood photo



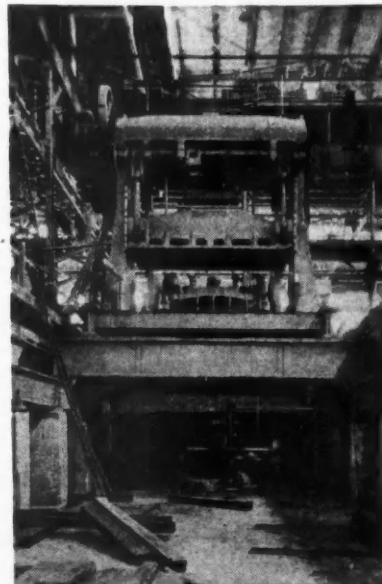
\$\$\$ filled the pockets of factory workers as leading car manufacturers announced wage increases, bonuses and record dividends. GMC announced a \$1.50 year-end dividend; a wage bonus of \$10,000,000 and immediate wage and salary increases. Chrysler declared record dividend. Total extra compensation to Chrysler employees during 1936, \$8,300,000. Many other companies made similar returns of prosperity to their employees.

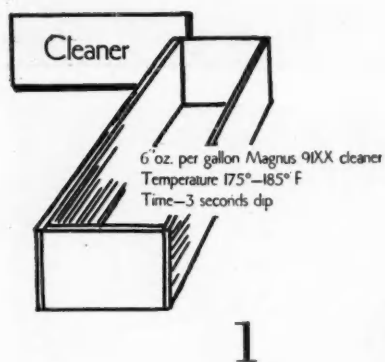
REGISTRATIONS soared to record count as millions applied for 1937 license plates. Preliminary estimates of total number of motor vehicles in circulation in the U. S. made by AUTOMOTIVE INDUSTRIES indicate 28,424,077. Approximately 3,300,000 new passenger cars were registered this year which together with new trucks sold means that very close to 4,000,000 new vehicles have gone into circulation in 1936.

AIRCRAFT production meeting, first to be sponsored by the SAE, was held in Los Angeles in October. Besides discussing technical papers the 500 delegates were entertained by airline hostesses who told of their experiences aloft.

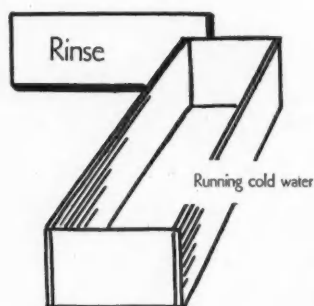
MONSTER of industry is this "turret top" press which was installed at the Grand Rapids stamping division of Fisher Body. (Right.)

'37 MODEL introductions spread from early in September to the opening of the New York show on Nov. 11. Most spectacular was the Ford presentation in the Michigan state fair coliseum. Following the introduction, the 8000 visiting dealers were banqueted in the immense night club setting shown below.

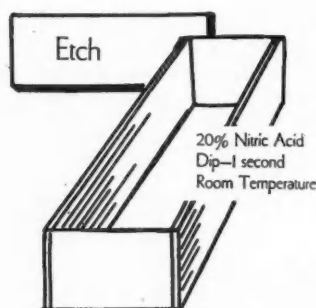




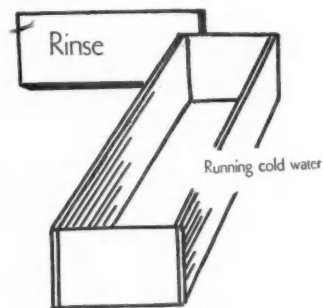
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3



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IMMERSION tin-plating of aluminum alloys is made possible by the fact that aluminum, being above tin in the electromotive series of metals, will displace the tin in an alkaline solution. This article is an outline of the operations involved in depositing tin coatings on aluminum-alloy pistons.

The illustrations show graphically the steps in the process and the essential specifications of each. We have also included in the article instructions for the chemical determinations required to control the tin bath in production. In the detailed description which follows we discuss each step separately, beginning with the first operation, the cleaning bath.

The purpose of the cleaning dip is, of course, to remove grease and cutting compounds. This is accomplished by a two- or three-second dip in a hot solution of metal cleaner. The cleaner should be one which will not readily attack aluminum, i.e., one whose free alkali content is low, or which contains inhibitors. The Magnus 91XX was used throughout our experiments.

The cleaning solution is made up by adding five or six ounces of cleaner per gallon of water. The solution should be kept at between 175 and 185 deg. F., and an automatic temperature control should be installed on the cleaning tank. If the temperature is permitted to rise too high, a blistered plate will be deposited. If the cleaning solution is allowed to become too cool, the cleaner is not effective and poor plating will result. It is not essential that the aluminum be chemically clean, that is, free from water breaks. A small water break will not cause any harm, as the tin-plating bath, being alkaline, will complete the cleaning. In fact, it would be much better to have a small water break than to leave the piston in the cleaner for a longer period of

time. Leaving the pistons in the cleaner for longer periods of time causes blistering and also a rough coating.

A rack suitable for use in the cleaning solution, and all of the following steps is best made of steel with a very heavy chromium plate. The tank can be of sheet steel heavy enough to withstand routine bumping.

The second step is a cold-water rinse to remove the cleaner. This should be running water in a tank similar to the cleaning tank.

The third step is a one-second dip in a 20 per cent nitric-acid solution, to remove the last traces of cleaner. If any cleaner is left on the pistons, it would be transferred to the tin bath and tend to build up the free alkali. The effect of the free alkali in the tin bath will be discussed below. The acid solution is used at room temperature. The acid should be kept in either a stone-ware tank or a wooden tank lined with asphalt.

The fourth step is a cold rinse. This should be running water and may be the same tank as that used to rinse after Step No. 1.

The fifth step is the immersion plating. This is accomplished by a three-to-five minute dip in a hot solution containing 6 ounces per gallon of technical sodium stannate. The sodium

Tin Plating A

stannate used should be of fresh stock and also have a low free alkali content. By free alkali is meant alkalinity present other than due to the carbonates and alkalinity due to the disassociation of the sodium stannate. The conditions

necessary for obtaining a good tin coating are: First, that the temperature of the bath be very carefully maintained between 175 and 180 deg. F.; second, that the tin content be held between 0.8 and 2.15 ounces per gallon;

third, that the free alkali be less than 1.25 ounces per gallon.

If the temperature of the stannate bath is not high enough, only a small amount of tin will displace the aluminum, with the result that the coating will be very thin. Allowing the temperature to rise above the maximum will cause blisters in the coating. Most of the blisters encountered in this process will have been caused by a lack of temperature control. For this reason an automatic control on the bath is very essential. It might be well to state that blistering as mentioned in this article cannot be seen with the naked eye. A binocular microscope with a magnifying power of 30 is used, and the blisters appearing are small even then.

Other factors being normal, the tin content of the bath and length of immersion control the thickness of the coating deposited on the pistons. Within the tin limits as previously given, a

Aluminum-Alloy Pistons

By Dale Brown, V. Shulnburg and G. Dell*

uniform thickness is deposited. As the tin content drops below the lower limit, the coating becomes thinner. In a new solution, the first few pistons will have a thicker coating. However, this is not true after the tin content has been replenished by additions of sodium stannate. Before additions are made, the bath should be analyzed for tin and free alkali. The sodium stannate should always be dissolved in water and then added slowly to the bath. The bath should be stirred vigorously while the addition is being made.

When a piston is first placed in the bath, vigorous boiling takes place, with evolution of hydrogen gas. This boiling continues for two to three minutes, and then only a few bubbles of gas are evolved. After the boiling has stopped, nearly all the tin that it is possible to deposit has been plated on the piston. Longer periods of time cause blistering and etching of the coating. This is especially true when the free alkali is high.

must be examined with a microscope.

The free alkali increases as the bath is operated and also when additions of sodium stannate are made. Acetic acid may be used to neutralize the alkali. Several precautions must be taken when adding the acid, or the tin will be precipitated as stannic acid. They are as follows: First, the acetic acid used must be added in the form of a solution containing not more than 10 per cent of acid by volume. Second, the acetic acid must be added *very slowly*, and the bath must be violently stirred so as to permit the stannic acid that is being formed to redissolve. Third, the acid should be added when the tin content is near the lower limit. When the tin content is high, the stannic acid is not as apt to redissolve, and the tin would be lost. This means that the acid should always be added before the sodium stannate. Sufficient acid should be added to neutralize nearly all the free alkali, or more will have to be added after the bath has been operated a short time. If the sodium stannate is not first dissolved and then slowly added, the acid which

has just been added tends to react with the sodium stannate and precipitate the tin.

A sludge will collect in the bottom of

the tank, composed of stannic acid and sodium-aluminum compounds. This may be removed periodically, but does not affect the operation of the bath.

The sixth step is a rinse in running cold water, followed by a rinse in hot water to dry the pistons, after which they are ready for use.

These steps, if followed as outlined above, will produce a coating of tin about 0.0002 in. thick on aluminum piston alloys. The coating is of a bright gray characteristic tin color, and a good coating should have considerable metallic lustre. Dark coatings are poor coatings and indicate unusually high alkalinity or low tin in the bath.

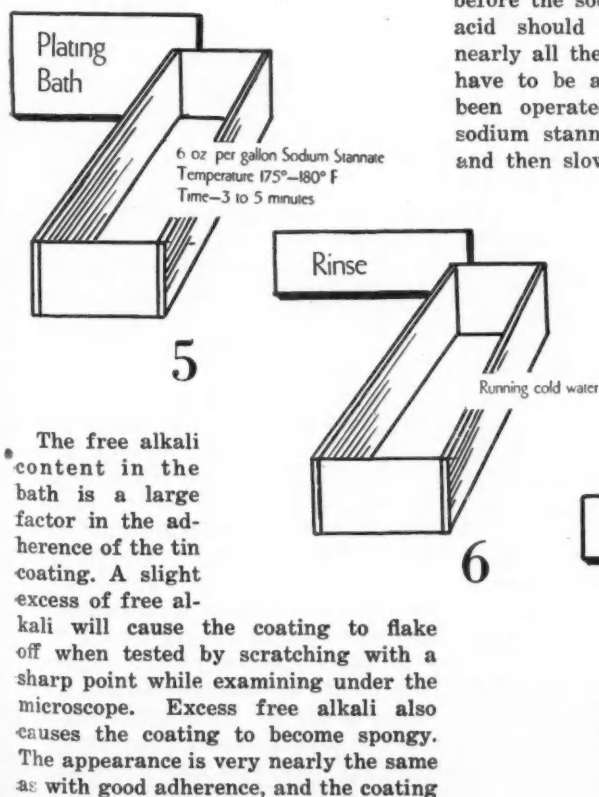
Methods of Bath Control

We have as yet no control test to apply to the tin coating itself, other than that of scratching the tin coat with a sharp needle point under the binocular microscope. When this test is applied, poor coatings peel off in flakes, while brighter, better, unblistered coatings are adherent.

Methods for the Control of Solution

FREE ALKALI—Into a 250 cc. Erlenmeyer flask, carefully measure 10 cc. of clear and cold plating solution from a pipette or burette. To this add 50 cc. of barium chloride solution. This solution is made by dissolving 100 grams of barium chloride in 1000 cc. of water. The purpose of the barium chloride is to precipitate all carbonate as barium carbonate and the sodium stannate as barium stannate. The flask is then tightly stoppered, shaken, and allowed to stand for five to ten minutes. After standing the required time, add about five drops of phenolphthalein indicator solution, made by dissolving half a gram of phenolphthalein in alcohol and diluting with water to 100 cc. Then add one-tenth normal hydrochloric acid

* Chem. Engrs., Bohn Aluminum & Brass Corp.



from a burette until the solution just turns white and shows no pink coloration. On standing a few minutes, the solution begins to turn pink again, but this change can be disregarded. It is due to the dissociation of barium stannate and does not enter into the general scheme of analysis. The amount of free alkali is determined by the equation: No. of cc. acid used $\times 0.40 \times 0.134 =$ ounces of free alkali per gallon. Some methods of analysis involve filtering the precipitate of barium carbonate and barium stannate before titrating with hydrochloric acid. This method has been abandoned in this laboratory because there is no method for knowing when the washing of the precipitate is complete. Due to the slight solubility of barium stannate, a test for the presence of alkali is confirmed even after using several liters of wash water. The washings will continue to show pink to phenolphthalein until all barium stannate has been dissolved.

TIN CONTENT—For the standardization of the KIO_3 solution the following apparatus is required: A 500-cc. Erlenmeyer flask with a one-hole stopper carrying a glass tube bent so that the outer end may be immersed in a solution of sodium bicarbonate. The solutions required are as follows: Hydrochloric acid of 1.19 sp. gr.; a saturated solution of sodium bicarbonate in distilled water; a starch solution prepared by first making a paste of 1 gram of soluble starch and pouring it into 150 cc. of hot water, the solution being made as required; a potassium iodide solution made by dissolving 1.43 grams of KIO_3 , 10.00 grams of KI and 1.00 gram of KOH in distilled water and diluting to make 1 liter.

Weigh out 0.50 gram of solder having a known tin content and place in a 500 cc. Erlenmeyer flask. Add 20 cc. concentrated sulfuric acid and set on hot plate. Boil until there are no particles of metal showing, and allow to cool.

Now add about 150 cc. of water, 60 cc. of concentrated hydrochloric acid, and 2 grams of powdered antimony metal. Insert the stopper and delivery tube in the flask and boil 25 minutes. Before removing from the hot plate, and while the solution is boiling freely, immerse the outer end of the delivery tube in a 400 cc. beaker which is about half full of sodium bicarbonate solution. Place both in running water and allow to cool; as the flask cools, sodium bicarbonate will be drawn in. This provides an atmosphere of carbon dioxide and prevents the oxidation of the tin. After it is cool, remove the delivery tube and filter through an asbestos pad

with the use of a suction pump. This is done to make a clearer end point than is possible in the presence of powdered antimony. While some chemists may not approve of filtering, good results can be obtained if filtered by suction. However, speed is essential at this point. Immediately add to the flask 3 cc. of starch solution and titrate with KIO_3 solution until a permanent faint blue color is present. The number of grams of tin used divided by the number of cc. of KIO_3 solution gives the factor. By carefully weighing the amount of KIO_3 recommended here, the factor should be 1 cc. of potassium iodate solution equal to 0.0025 gram of tin.

TIN IN THE PLATING BATH—By means of a pipette or burette, transfer 5 cc. of the clear cold plating solution into a 500 cc. Erlenmeyer flask. Dilute to 150 cc. with water and then add 60 cc. of concentrated hydrochloric acid and two or three grams of powdered antimony metal. Insert the stopper

with the delivery tube attachment and set on a hot plate. Boil fifteen minutes, and just before removing, insert the outer end of the delivery tube into the sodium bicarbonate solution and then place both in running water. After the flask is cool, remove the delivery tube and filter through an asbestos pad, using suction as before. Immediately add 3 cc. of starch solution and titrate with the KIO_3 solution until a faint blue color persists. If the tin content is low, as in an exhausted bath, add $\frac{1}{2}$ gram of potassium iodide before titrating. This provides enough iodine to insure a blue color when the end point is reached. The amount of tin is determined as follows:

$$\text{No. cc. } KIO_3 \text{ used} \times \text{factor} \times 1000$$

$$\text{Volume of solution (5 cc.)}$$

$$\times 0.134 = \text{oz. of tin per gal.}$$

For example, a new bath took 30.3 cc. KIO_3 , and the factor is 1 cc. — 0.0025 gm. tin.

$$\frac{30.3 \times 0.0025 \times 1000}{5}$$

$$\times 0.134 = 2.03 \text{ oz. of tin per gal.}$$

Some 1936 Transportation Developments*

NEW Diesel-electric locomotives, either placed in service or under construction by railroads and industrial transportation companies, numbered more than 50 units for the year. This is approximately double the number delivered during the previous year. The largest of these in switching and transfer service were the Illinois Central Railroad's 2000- and 1800-hp. units.

The demand for the trolley coach in modern transportation service continued during the year, and more than 400 of these vehicles were provided. While many of these were furnished for extensions to existing trolley coach lines, a number of new installations were made: notably those in Flint, (Mich.), Milwaukee, (Wis.), Louisville, (Ky.), and Cincinnati (Ohio). The most recent figures indicate a total of 37 companies operating 1187 trolley coaches.

An interesting feature in the city transit field is the invasion of the Diesel bus as a substitute for the usual gasoline vehicle. The Public Service Coordinated Transport Company, of Newark, (N. J.), is now operating 27 of these buses, all of them equipped with electric drive. The City of Baltimore, on the other hand, placed in service 10 additional gas-electric buses.

A new piece of equipment, developed for use with these buses, is a 10-cu. ft.

light-weight air compressor. This compressor operates at 1200 r.p.m., and is direct driven from the engine. Aluminum alloy has been used wherever practicable to secure light weight.

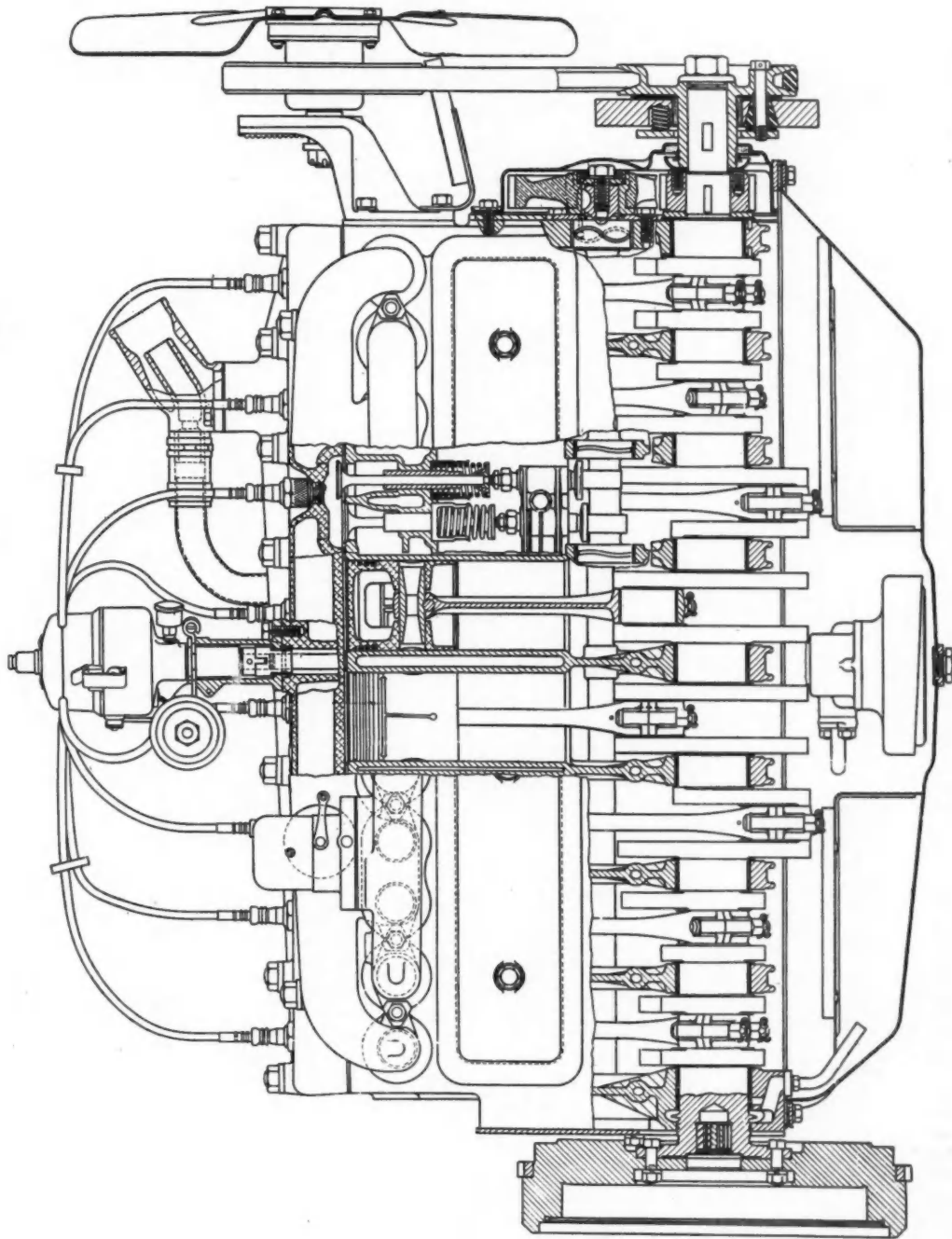
Following several years of experience in the manufacture of refrigerated truck bodies, particularly for distributing ice cream, a new line was developed for 1937, consisting of a single type suited for use with any method of refrigeration, including mechanical, eutectic, and dry-ice.

Depending upon the type of refrigeration used, and the type of containers, these truck bodies will handle from 430 to 990 gals. of ice cream. The new truck body will have an attractive streamlined appearance and is suited for mounting on a $1\frac{1}{2}$ -ton truck chassis.

A NEW Gnome-Rhone aircraft engine, the L-18, an 18-cylinder radial, has been given an approved-type certificate by the French Air Ministry. It is of quite large diameter, 55 in., and some very interesting problems were met with in its development, especially in connection with the connecting-rod assembly, because in order to operate at high speed and give a high specific output, long connecting rods were necessary, and these naturally led to a large overall diameter. In aircraft engines it is, of course, desirable to have the forwardly projected area as small as possible.

*From John Liston's "Annual Review of Electrical Industry," *G. E. Review* for January.

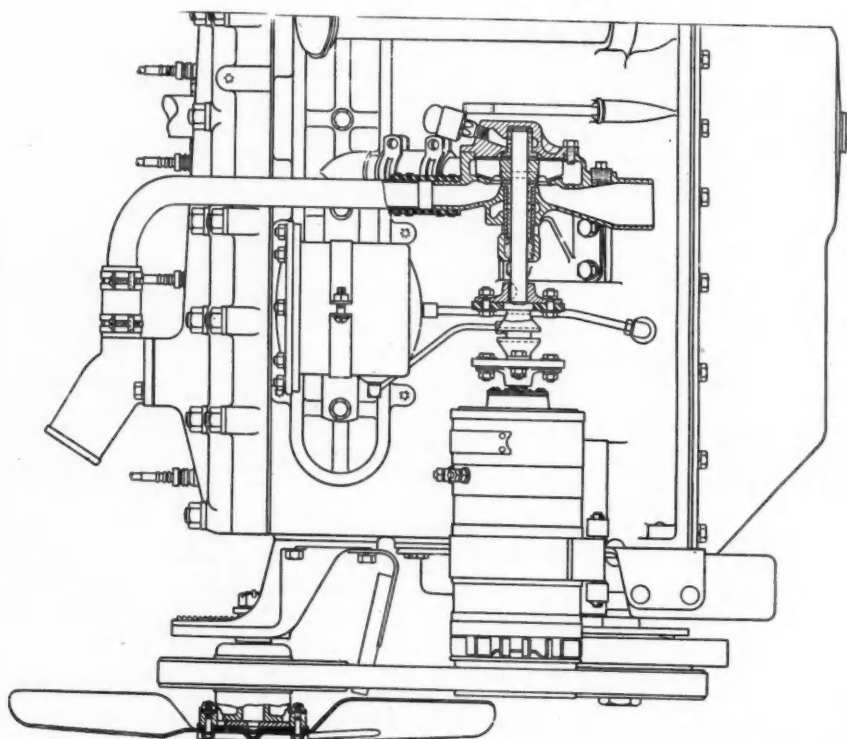
Studebaker 8-Cyl. Engine for 1937



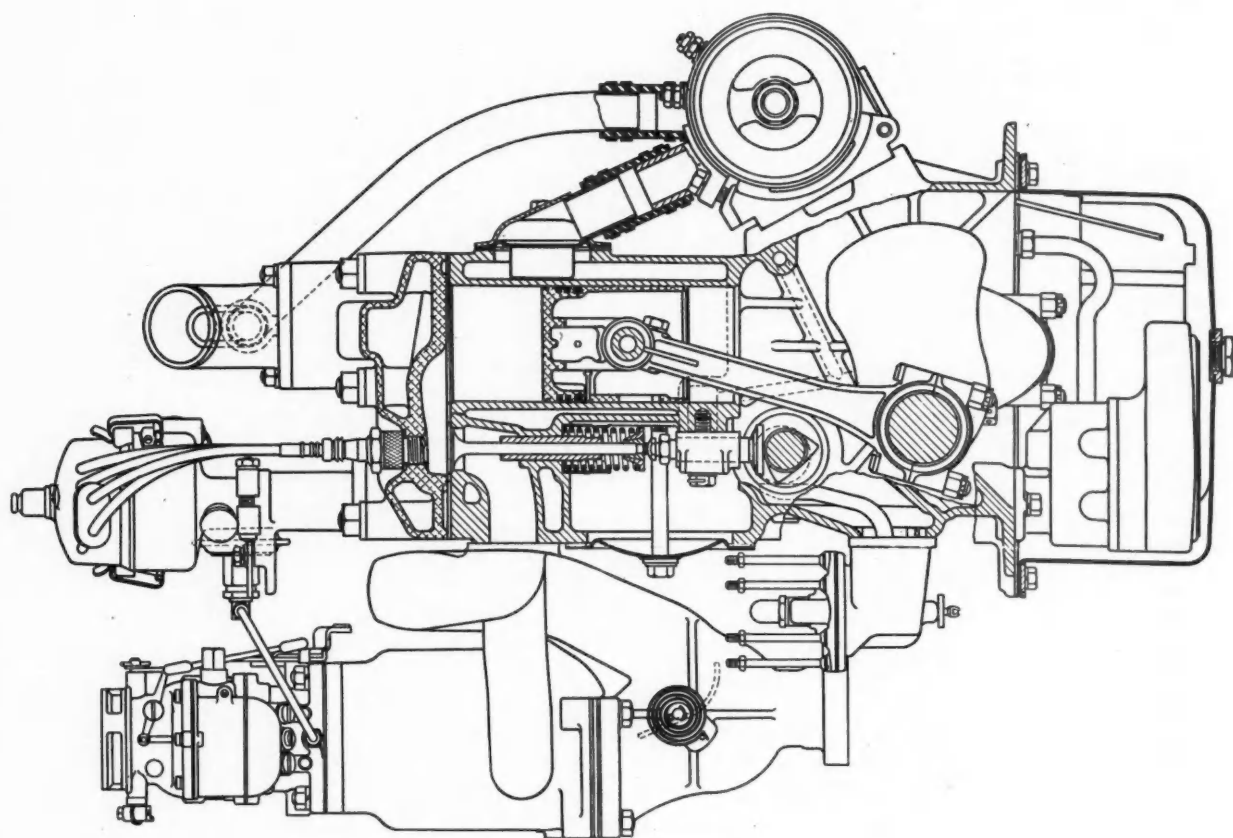
This engine has a bore of $3\frac{1}{16}$ in. and a stroke of $4\frac{1}{4}$ in., giving it a displacement of 250.4 cu. in. It has a compression ratio of 6.5 to 1 and is rated 115 hp. at 3600 r.p.m. At 2,000 r.p.m. the torque is equal to 205 lb.-ft. Cylinder heads and pistons are of aluminum alloy.

No. 6 in the AUTOMOTIVE INDUSTRIES
Series of Engineering Drawings

Studebaker Engine for 1937



Partial side elevation showing fan, generator, and water-pump drive, with details of pump, and cross section through a cylinder axis. Note water by-pass from cylinder head to pump inlet. Crankshaft is mounted in eight bearings and is completely counter-balanced. It carries a rubber-hysteresis-type torsional-vibration damper at the forward end.



TIRES, WHEELS, SPRINGS, SHACKLES

Line Number	CAR MAKE AND MODEL	TIRES			WHEELS		SPRINGS				SHACKLES				Line Number										
		MAKE	SIZE	No. of Plies	Inflation Pressure		Axle Clearance for Jack (Ins.)	RIM		FRONT				REAR											
					Front	Rear		Type	Make	Diameter (Ins.)	Width (Ins.)	Suspension	Radius Rods or Sway Eliminators	Type		Make	Material	Length	Width	No. of Leaves	Spring Rate (Lbs. per In.)	Lubrication of Leaves	Spring Cover Make	Type	Make
1	American Bantam	654 Various	4.75/16	4	28	28	10 1/2	SFA	MW	16.0	4.50	Con	Yes	T	Det	SM	38	2 1/2	8	98	Gra	Yes	Ru	PM	1
2	Auburn	852 Various	6.00/16	4	30	30	10 1/2	WI	MW	16.0	4.50	Con	Yes	E	Det	SM	42	2 1/2	8	120	Gra	Yes	Ru	PM	2
3	Auburn	SC-852 Various	7.00/16	4	32	32	10 1/2	WI	MW	16.0	4.50	Con	Yes	C	Det	SM	42	2 1/2	8	120	Gra	Yes	Ru	PM	3
4	Buick	36-40 US, Fir	7.00/16	4	22	28	10 1/2	Disc	MW	16.0	5.00	Con	No	C	Det	SM	42	2 1/2	8	120	Gra	Yes	Th	PM	4
5	Buick	36-40 US, Fir	7.00/16	4	22	28	10 1/2	Disc	MW	16.0	5.00	Con	No	C	Det	SM	42	2 1/2	8	120	Gra	Yes	Th	PM	5
6	Buick	36-40 US, Fir	7.00/16	4	22	28	10 1/2	Disc	MW	16.0	5.00	Con	No	C	Det	SM	42	2 1/2	8	120	Gra	Yes	Th	PM	6
7	Buick	36-40 US, Fir	7.00/16	4	22	28	10 1/2	Disc	MW	16.0	5.00	Con	No	C	Det	SM	42	2 1/2	8	120	Gra	Yes	Th	PM	7
8	Buick	36-40 US, Fir	7.00/16	4	22	28	10 1/2	Disc	MW	16.0	5.00	Con	No	C	Det	SM	42	2 1/2	8	120	Gra	Yes	Th	PM	8
9	Cadillac	V8-60 US, Fir	7.00/16	4	25	30	10 1/2	Disc	MW	16.0	5.00	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	9
10	Cadillac	V8-60 US, Fir	7.00/16	4	25	30	10 1/2	Disc	MW	16.0	5.00	Con	No	C	Det	SM	42	2 1/2	9	120	Gra	And	And	PM	10
11	Cadillac	V8-60 US, Fir	7.00/16	4	25	30	10 1/2	Disc	MW	16.0	5.00	Con	No	C	Det	SM	42	2 1/2	9	120	Gra	And	And	PM	11
12	Cadillac	V8-60 US, Fir	7.00/16	4	32	32	11 1/2	Disc	MW	16.0	5.00	Con	No	C	Det	SM	42	2 1/2	9	120	Gra	And	And	PM	12
13	Cadillac	V8-60 US, Fir	7.00/16	4	32	32	11 1/2	Disc	MW	16.0	5.00	Con	No	C	Det	SM	42	2 1/2	9	120	Gra	And	And	PM	13
14	Cadillac	V8-60 US, Fir	7.00/16	4	36	36	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	14
15	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	15
16	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	16
17	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	17
18	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	18
19	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	19
20	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	20
21	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	21
22	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	22
23	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	23
24	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	24
25	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	25
26	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	26
27	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	27
28	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	28
29	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	29
30	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	30
31	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	31
32	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	32
33	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	33
34	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	34
35	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	35
36	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	36
37	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	37
38	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	38
39	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	39
40	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	40
41	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	41
42	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	42
43	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	43
44	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	44
45	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	45
46	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	46
47	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	47
48	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	48
49	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	49
50	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	50
51	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	51
52	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	52
53	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	53
54	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	54
55	Cadillac	V8-60 US, Fir	7.00/16	4	30	30	10 1/2	WD	MW	16.0	4.19	Con	No	C	Det	SM	42	2 1/2	10	145	Gra	And	And	PM	55

ABBREVIATIONS:
 (g) - Dict. Planer—Independent
 G - Graphite Grease
 Gd - Gdgrade No. 32
 H - Harris Products
 (b) - Dict. Planer—Transverse
 13 Leaves
 Lp - Lubriplate
 M - Mather
 Mac - Mechanical
 (e) - 5.25/17-2 Door Sedan, 6.00/16-4 Door Sedan
 E - Eaton
 EM - Eaton or Mather
 (f) - 5.25/17-2 Front 28, Rear 32; 6.00/17-2 Front 24, Rear 28
 F - Free Length
 Fa - Fabric
 Fr - Firestone
 BJ - Bumper Jacks Used
 C - Coil
 Chm - Chrome Manganese Steel
 Con - Conventional
 CS - Chromium Steel
 CV - Chrome Vanadium Steel
 D - Disc
 Det - Detroit Steel Products Co.
 BJ - Bumper Jacks Used
 C - Coil
 Chm - Chrome Manganese Steel
 Con - Conventional
 CS - Chromium Steel
 CV - Chrome Vanadium Steel
 D - Disc

Photorelay Operates Parking Lights

AMONG the relatively few novelties exhibited at the recent Paris automobile show was a device which lights the parking lamps of a car automatically when darkness sets in and extinguishes them automatically when it becomes light again. The device is known as the Photorelay Chilowski (Chilowski-Tubest System) and is being manufactured by Société Tubest, 6 rue Euler, Paris. It appears that in France it is a very common thing to receive a "ticket" for failure to light parking lights during hours of darkness, and in Paris alone 29,000 charges of this kind were made last year. It was to protect motorists against unpleasant experiences of this kind that the new device was developed. It is no larger than a Swedish match box and is mounted on the instrument board. In the following the principle of operation will be briefly described.

In a classical chemical experiment students are shown the effect of light on a gaseous mixture of chlorine and hydrogen. In the dark these two gases are absolutely inert toward each other, but when subjected to light they combine instantly, forming hydrochloric acid, which reaction takes place without change in volume.

Let us imagine a closed vessel containing a solution of hydrochloric acid in the presence of an atmosphere of hydrogen and chlorine, and that an electric current of adequate voltage is passing through the solution. Owing to the resulting electrolytic effect, hydrogen and chlorine are evolved, both of which are insoluble in the solution from which they are produced. However, if the vessel is illuminated, the hydrogen and the chlorine recombine to form hydrochloric acid, which is immediately absorbed by the solution. If the effect of the light is stronger than that of the electric current, the gaseous mass in the vessel diminishes, while in the opposite case it increases. In this way variations of volume or of pressure are obtained, by means of which changes in light intensity or in electric currents may be converted into mechanical effects. These reactions, moreover, are independent of the surrounding temperature.

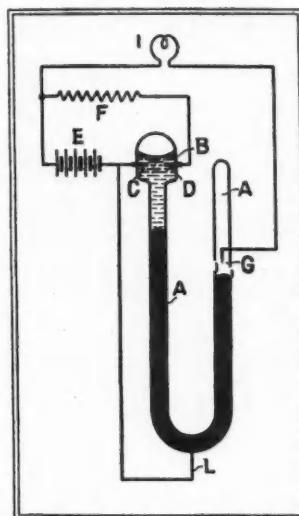


Fig. 1—Diagram illustrating the principle of the Chilowski photorelay

It is on the above principle that M. Chilowski's ingenious photo-relay is based. It must not be confounded with the photo-electric cell, which produces or controls an electric current in accordance with the intensity of the light falling upon it. These currents are always of very low intensity. The Chilowski photo-relay, on the other hand, produces a powerful mechanical effect by means of which electric con-

tacts capable of handling heavy currents are opened and closed directly. It is obvious from the foregoing that the operation of the photo-relay depends upon the establishment of an equilibrium, which always takes some time, for which reason it is not a suitable substitute for the photo-electric cell in most of its applications.

Fig. 1 is a diagram which will serve to explain the principle of operation of the device. A U tube closed at both ends is partly filled with mercury. One of the arms A terminates in an enlargement B of transparent material which contains a solution of hydrochloric acid or, preferably, a solution of calcium-chloride in hydrochloric acid, resting on the mercury. The upper end A' of the other arm, above the mercury, is filled with an inert gas. The U tube is essentially a pressure gage.

Two electric terminals C, D, supplied with current from a battery E through the intermediary of an adjustable resistance, enter the hydrochloric-acid solution. Within arm A' of the tube there is an electrode G connected to lamp I, and when the mercury rises sufficiently to make contact with G, the lamp circuit is closed through battery E.

A current of a few milli-amperes passes constantly from the battery through the hydrochloric-acid solution and decomposes the acid. If the chamber B is in the dark, the chlorine and the hydrogen accumulate in the upper part of B and press against the mercury, which then rises in the other arm of the tube, thereby establishing contact with G and closing the lamp circuit. But if vessel B is illuminated, no accumulation of gas can take place, as the hydrogen and nitrogen combine again. The hydrochloric acid formed redissolves, and there is a tendency for the pressure to drop. For any given flow of electrolyzing current, a particular intensity of illumination establishes an equilibrium which translates itself into given heights of the mercury columns in the two arms of the U tube. When the illumination increases and attains a certain value, the level of mercury in the right arm drops, contact

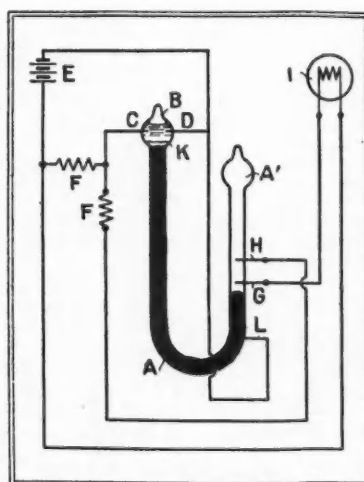


Fig. 2—Photorelay with platinum diaphragm and its connections for automatically lighting and extinguishing the parking lights

with electrode *G* is broken, and the lamp is extinguished. The variable resistance *F* serves to control the electrolytic current and thus the rate of gas generation. Consequently, it permits of controlling the level of the mercury in the right arm.

Fig. 2 represents a first model developed by M. Chilowski. In order to prevent chemical attack of the mercury by the hydrochloric acid, the two are separated by a very thin corrugated diaphragm *K* of platinum-iridium. In arm *A'* of the tube there are, besides the electrode *L* which carries the battery current to the column of mercury, the electrode *G* in series with lamp *I*, and above the last-mentioned, another electrode *H*, connected to the electrode *C*. The latter serves to prevent continuous formation of gas in the electrolytic chamber when not illuminated. Accumulation of gases in the electrolytic chamber, when there is no recombination due to an absence of light, causes the column of mercury in arm *A'* to rise, and when the mercury comes up to electrode *H*, electrodes *C*, *D* are short-circuited and the production of gas ceases. Lamp *I* remains lighted, however.

As soon as vessel *B* is sufficiently illuminated, a recombination of gases takes place again, the mercury drops out of contact with *H* and *G* successively, and the lamp becomes extinguished.

Production of an elastic diaphragm and its insertion into the tube present serious difficulties. The model shown in Fig. 3 represents important improvements, not only from the standpoints of sensitiveness and precision, but also from that of cost of construction. It comprises three distinct parts: the electrolytic chamber *B*, a capsule *M* with two compartments separated by an elastic diaphragm *N*, and a U tube *A*, *A'* containing mercury and fitted with the necessary electrodes. The capsule *M* consists of two slightly domed glass disks *M*₁, *M*₂ between which the diaphragm *N* of very thin glass is clamped. The lower compartment of this capsule is in communication with the electrolytic chamber through the intermediary of a capillary tube *P* of platinum-iridium alloy. The upper compartment communicates with arm *A* of the mercury tube through tube *Q*.

Pressure variations produced in chamber *B* by variations in the intensity of illumination are thus transmitted to the upper compartment, which is always filled with liquid. Under the effect of these variations the diaphragm *N* is deflected upward or downward, the deflections being exceedingly small, amounting to only a few tenths of a millimeter. They are not visible to the naked eye. This is said to explain the

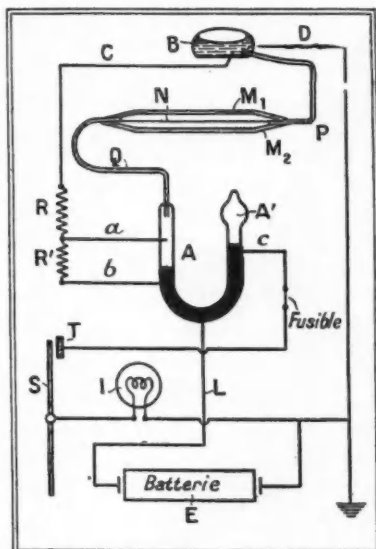


Fig. 3—Diagram of connection of photorelay

great reliability of the device in spite of the thinness of the glass diaphragm.

The lower compartment of the capsule, as well as arm *A* of the mercury tube, is filled with an inert gas. Any displacements of the diaphragm result in corresponding displacements of the column of mercury in one direction or the other, and in an opening or closing of the circuits having electrodes in the tube.

Fig. 3 explains how the device is arranged for the automatic control of parking lights, and how in that case complete automatic action is obtained.

In daylight, the electrolytic chamber being completely illuminated, a vacuum is formed in *B*, the glass diaphragm presses downward, the mercury column rises in the left arm of tube *AA'* and closes the circuit at electrode *a*; electric current from the vehicle battery flowing through wire *L* to the mercury column passes through the

electrolyte between the electrodes *C*, *D* of platinum-iridium, after having passed through the relatively small resistance *R*. The electrolytic action and the generation of gas then attain their maximum value. When darkness sets in, the pressure in *B* increases, the mercury in tube *A* descends and breaks contact at electrode *a*, but it still continues the contact at electrode *b* in the left arm through which the current is carried to the electrolytic chamber through the two resistances *R*, *R'* in series. In the right arm of the tube the mercury rises and attains the electrode *c*, thus closing the battery circuit through bulb *I* of the parking light. Introduction of the resistance *R'* in the electrolytic circuit lowers the electrolytic current to its normal value, which it maintains throughout the period the parking light is burning. When darkness increases, the mercury drops still farther in arm *A* and breaks contact at electrode *b*. The electrolytic current is then completely interrupted. But the circuit of the parking light remains closed at electrode *c*.

At night, when the vehicle is put into the garage, the parking lights, of course, must not light up automatically. To prevent them from doing so there has been provided a very ingenious interrupter on the battery circuit. Its movable part consists of a pivoted pallet *S*, while its fixed part consists of a small magnet *T*. In order to break the circuit, the motorist when putting his car into the garage need only press in the proper direction on the lower part of the pallet.

When the car leaves the garage, the first acceleration or the first retardation by the brakes sets the pallet *S* swinging, and it is immediately attracted by the magnet *T*. Thus the device is automatically returned to the working position without intervention of the driver.

Unconventional Fuels Used In Belgian Competition

RATHER unconventional motor fuels were used in the recent national fuels competition in Belgium. With most of these abnormal fuels the starting ability of the engines is a sore point. From this point of view the fuels were put to a severe test on the last two mornings of the trial, following upon cold and damp nights. One truck operating on crude cotton-seed oil got away in 30 seconds, another operating on peanut oil got started in 30 seconds, and a truck operated on gas under pressure, in 40 seconds. The various trucks

fitted with gas generators required 40 and 50 seconds for starting. The truck operating on cotton-seed oil had a fuel mileage of 8.7 per U. S. gallon. One passenger car operated on hard coal participated in the trial and covered the first half, about 186 miles, on 220 lb. In connection with the foregoing it is announced that the Belgian Minister for Colonies has made an appropriation of 200,000 francs to a Committee on Colonial Motor Fuels in order to enable it to carry out its experiments of vegetable origin in the Belgian Congo.



Fig. 1

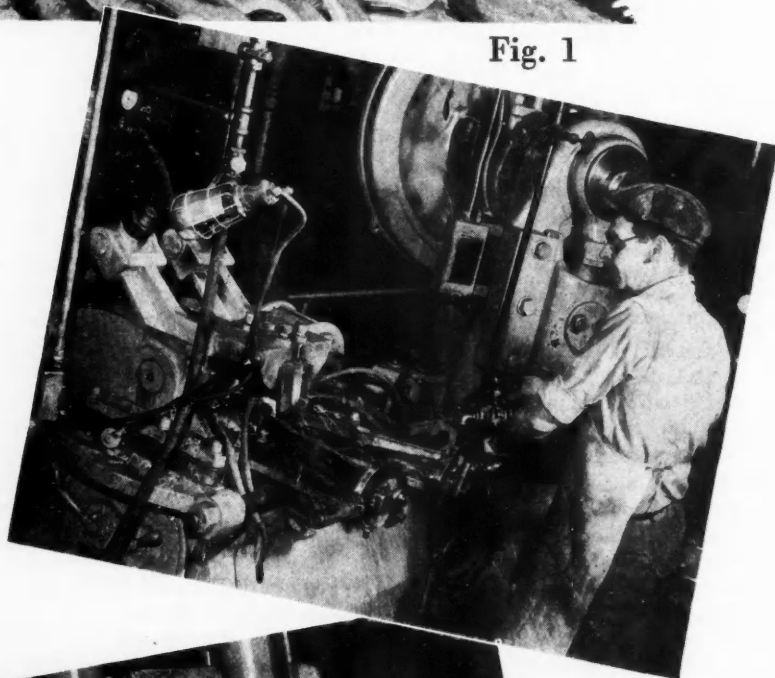


Fig. 2

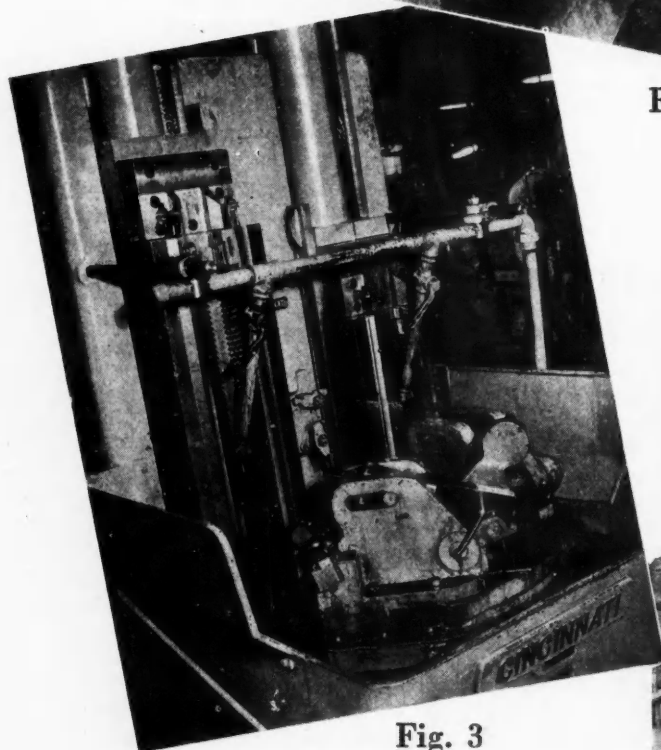


Fig. 3

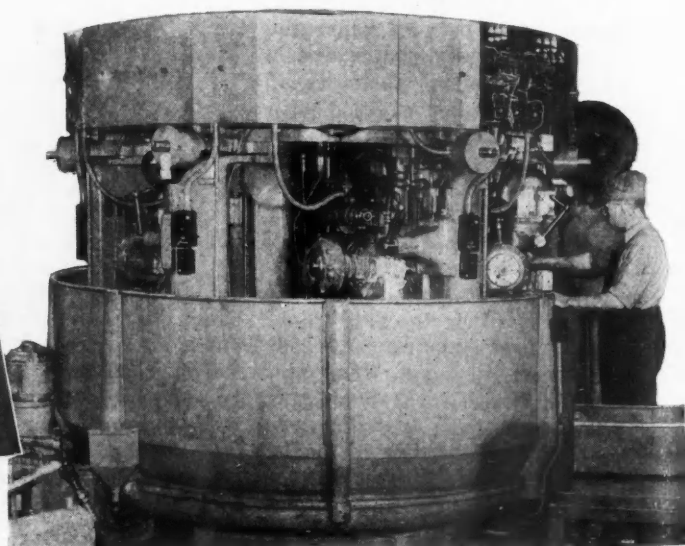


Fig. 4

Buick Puts

Fig. 1. Differential side of 40 and 60 Series banjo housing is ground on an Osterholm Automatic Grinder. The housing is clamped onto the work table, which, as the machine is started, raises the carrier against the grinding wheel. Upon contact with the wheel the work table rocks with a cradle motion from side to side for a predetermined period, automatically stopping and opening out for the removal of the housing—the position shown in the picture. Capacity about 25 an hour.

Fig. 2. Series 80 and 90 knuckle support lower arms are welded together at their outer ends on a National Electric Machine welder. They are shown clamped in the machine in correct relationship to each other. Pressure is applied by power driven toggle mechanism at the right.

Fig. 3. The steering knuckle boss on the Series 40 and 60 steering knuckle support is faced off on a Cincinnati Hydro-Broaching Machine. The heads can be operated independently of each other permitting the broaching of one piece while loading the other head. The holes in each end of the knuckle support are piloted onto studs, in the work holding-fixture, which also act as gages for the distance between these holes. Both broaches do the same type of operation at the rate of about 220 an hour.

\$14,500,000 More On the Line

WHEN the now familiar monthly production series was started in 1936, the facilities for building the 1936 Series Buicks were described in an article entitled "Buicks on the Line," which was published in *AUTOMOTIVE INDUSTRIES* June 6, 1936.

In succeeding months Buick was in the throes of a tremendous program of new building and general modernization of production facilities follow-

ing an appropriation of \$14,500,000 for the 1937 Series. This affected the existing assembly lines, the foundry, press shop, and the various production departments. And some of the new building program still is in progress.

Obviously this vast expenditure creates a new picture which may be adequately described only in a comprehensive feature article such as the one we published recently and in all probability this will be done later in the

current production series. However, at the moment we are presenting a small group of illustrations showing some of the new equipment recently installed in the axle division. These are typical of the changes wrought in other departments and indicate that Buick is drawing generously upon the almost inexhaustible resources of mechanical invention and upon the new techniques made available by machinery producers and allied industries.—J. G.

Fig. 4. Cutting the splines on the stub end of the 40/60 Series drive pinion on a Lees-Bradner 6 head spline hobber. Three of the heads can be seen; that nearest the operator just starting to raise automatically into cutting position on the blank inserted at the work station. Each hob cuts all the splines, and the machine has a capacity of 70 an hour.

Fig. 6. The 40 and 60 Series steering knuckles receive two different facing operations on this Colonial Hydraulic Broaching Machine. The broaches move vertically under hydraulic power, and can be operated independently of each other. Work-holding fixtures remain stationary, permitting the loading of one piece while the cutting operation is being performed on the other. This broach has a capacity of about 220 an hour.

Fig. 5. Series 40 and 60 rear axle housings are faced off and drilled on the end flanges for the brake discs and bolts, and milled internally, in the ends, for the main shaft (wheel) bearings, on the special Greenlee Machine which holds six housings. It has a capacity of about 25 an hour.

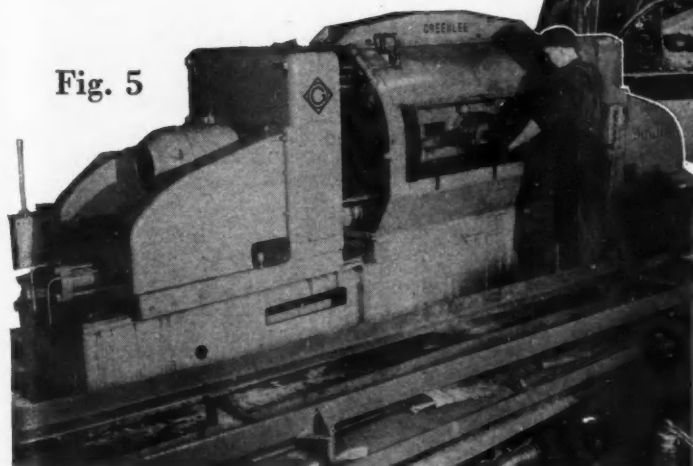


Fig. 5

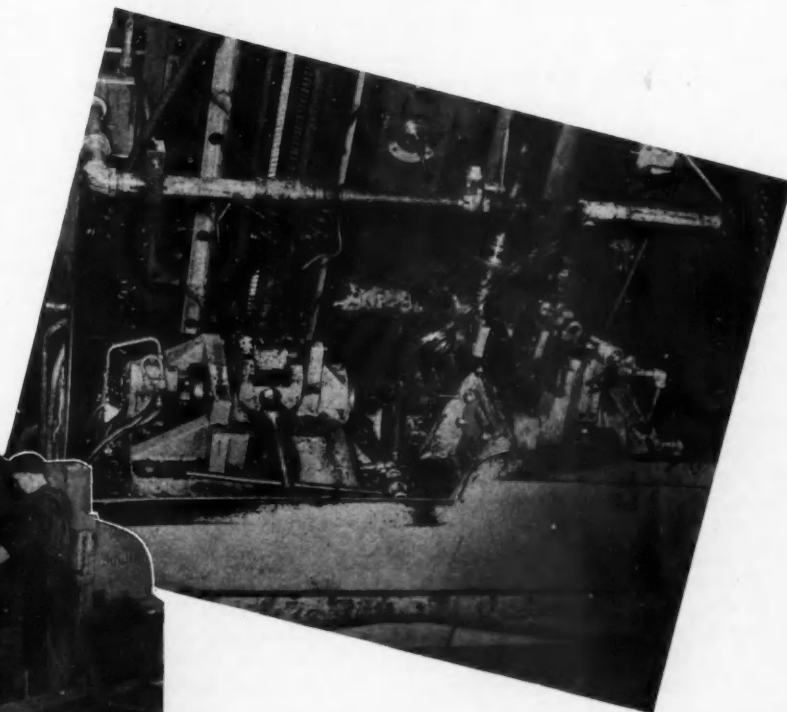


Fig. 6

What is the Ideal

Surface for Cylinders?

THE above question which was raised originally in a communication from Svea Bilwerkstad of Stockholm, Sweden. The problem, we have learned, is dealt with in "Le Moteur a Explosions" by Devillers and Mercès (Dunod, 92 rue Bonaparte, Paris), an extract from which is here reproduced in English, by permission of the publishers:

"A question which merits careful investigation is that of the finish of the cylinder bore, on which factor the quality of the engine and its resistance to wear are largely dependent.

"After the roughing cuts, the finishing operation is performed—either by means of a grinding wheel having a planetary motion; by boring with a laminated cutting tool, with final polishing operation by grinding wheel or fine-grained hone; or by grinding with a wheel and burnishing with non-cutting tools.

"In the first case the 'rectification' properly so-called is characterized by the removal of material until a perfect cylinder is obtained. This operation is effected by cutting and shaving tools, constituted by wheels of abrasive material such as carborundum, corundon, etc., endowed with a compound motion of rotation and reciprocation. This operation permits of bringing the bore to within 0.01-0.02 mm. (0.0004-0.0008 in.) by removing from 0.05 to 0.07 mm. (0.002-0.0028 in.).

"The finishing operation properly so-called, which gives a certain degree of polish, is effected in the same manner but with products of a finer grain, for the removal of the minimum amount of material (0.0004-0.0008 in.).

"It is useful to point out here that in this case the tool possesses, in both operations, a materially higher rotary speed than its reciprocatory speed. The result is that, whatever the degree of finish obtained, when examined micrographically the surface of the bore possesses crossing tool marks inclined at a certain angle to the elements of the cylinder.

"This is an important fact to which we shall return further on.

"In the second case the roughing is

effected by different tools, and polishing by means of cutting tools with fine-grained abrasive stones, the same as before. The tool marks observed by means of the microscope are also crossed, owing to the speed of rotation of the tools, which is preponderant in this case also.

"In the third case the first phase of the rectification properly so-called is effected by the removal of material with the aid of cutting tools fitted with abrasive cutters of carborundum, emery or other appropriate materials. The second phase avoids all removal of material; it is characterized by a matting of the cylindrical surface with the aid of non-cutting tools of very hard steel (of the Widia type). From this matting there results a great rise in temperature, which gives the burnishing and mirror-finishing effects, and at the same time a certain degree of hardening.

"In contrast to the two preceding cases, the matting tool of very hard steel is given a longitudinal speed which is materially higher than its rotary speed. If the matting tools are correctly made and maintained, there will be no tool marks on the surface. If tool marks are present they will always be in the direction of piston motion, as the longitudinal velocity predominates.

"A fair conclusion should be drawn from these observations.

"Scoring of the bore by the piston and rings is nothing but wear of insufficiently smooth surfaces in contact. This wear, which is very rapid when an engine is first placed in services, becomes at least very nearly stabilized, and infinitely small when the natural mirror finish of the bore is obtained. It will be understood that if it were possible to obtain a cylinder presenting at the very beginning, and before any wear had taken place, the appearance of a cylinder mirror-finished by wear, we would have an ideal case, and its rate of wear from the beginning would be that of the period of stabilized wear, that is, it would be a minimum.

"The finishing method described last in the foregoing, making use of non-cutting tools, with the longitudinal speed (in the direction of piston motion) preponderant, resulting in burnishing, hardening and mirror finishing, if it does not realize this ideal result, at least approaches it.

"Moreover, the fact that only fine-grained abrasive products are used for the finishing operation eliminates all possibility of scoring due to particles of emery or other abrasive material which adhere tenaciously to the pores of the cast iron in spite of the greatest possible care."

Oil-Cooler for Airplane Engines

A TWO-STAGE oil cooler for the lubrication systems of airplane engines has been developed by the firm of Gallay, Ltd., of London, England. With aircraft oil coolers it is necessary to prevent over-cooling and congealing of the oil, which is likely to occur when the plane dives or glides from considerable heights at low temperatures. In the Gallay system the oil circulates continuously through the cooling tubes of the front portion of the cooler, which are of large diameter, which constitute the first cooling stage. There is a con-

stant flow of heated oil direct from the engine through this portion of the cooler. The heated air passing through the first stage keeps the temperature in the second stage sufficiently high to prevent overcooling in the large tubes of this stage. When the oil temperature rises beyond a certain point, both the first and second stages of the cooler are effective, and the minimum oil temperature is thus controlled. The second stage of the cooler consists of tubes that have relatively small cross section.

A.S.M.E. Discusses—

Gas temperature measurement, super-charging with turbo-blowers and rubber springs

A PROBLEM of some automotive interest discussed at the meeting of the American Society of Mechanical Engineers in New York recently was that of accurate temperature measurements of gas flowing through a pipe. The standpoint from which it was discussed was that of the measurement of the temperature of flue gases, but the same principles apply equally to the measurement of the temperature of exhaust gases. The subject was dealt with in a paper by Professor Severinghouse of the Physics Department of Columbia University.

Temperature measurements of gases are usually made by means of thermocouples, but it is well known that in a flowing gas the temperature of the thermocouple is never equal to that of the gas. This is due to the fact that the thermocouple loses heat by both conduction and radiation; to make up for this loss the thermocouple must absorb heat from the gas constantly and it can do so only if there is a temperature gradient, in other words, if the temperature of the couple is less than that of the gas. To obtain the actual temperature of the gas some correction must be made for the heat losses.

Two investigators at Cornell University have suggested a plan to compensate for the heat loss by conduction. This consists in making measurements with a number of thermocouples of different thickness of wires. The heat loss by radiation will be greater the

larger the diameter of the wire, as the conductivity varies as the square of the diameter. Therefore, the temperature indicated will be lower with the large-wire thermocouple. Temperatures measured with the different thermocouples are then plotted against the diameter of the wire and the curve obtained is extrapolated to zero diameter, which should give the correct temperature so far as the effect of conduction is concerned. But there is loss of heat from a hot body also as a result of radiation, and this loss varies as the fourth power of the absolute temperature of the body, hence radiation should have an important influence on the accuracy of the measurement particularly at the higher temperatures.

To eliminate the effect of radiation, the author of the paper surrounded the pipe carrying the flow of gases whose temperature was to be measured, by another concentric pipe and heated the air in this pipe by an electric coil surrounding it. The theory is that if the air in the annular space between the two pipes is of the same temperature as the gas flowing through the inner pipe, then there will be no radia-

tion through the walls of the inner pipe and a correct temperature measurement can be obtained within the inner pipe by the usual thermocouple method.

A paper on supercharging of internal-combustion engines by turbo-blowers was presented by Alfred J. Büchi of Winterthur, Switzerland. Mr. Büchi has been working on turbo-blower superchargers for a long time, but recently has developed a system which overcomes some of the difficulties encountered with earlier installations. To obtain a high specific output at a low gas temperature, reduce heating effects and assure a high mechanical efficiency, it was found necessary to introduce the greatest possible amount of charging air into a cylinder of given size. In the Büchi system the cylinder is not only charged with compressed air, but it is also scavenged with a great quantity of cool air, scavenging being effected in spite of the back pressure on the exhaust due to the exhaust turbine.

Because of the rather low efficiency of the turbo-blower, approximately the same exhaust pressure as the blower pressure is necessary to drive the turbine, consequently it is practically impossible to obtain the excess of pressure in the charging air over that of the exhaust which would be necessary for effective scavenging. In the Büchi system this scavenging is made possible by creating strong pressure oscillations in the exhaust system between the exhaust port of the engine and the inlet to the turbine. To this end, in an engine with four or more cylinders, only cylinders whose exhaust periods do not overlap are made to exhaust through the same manifold, and in a 12-cylinder engine even four distinct exhaust passages, with four turbine nozzle rings, are used. The pressure oscillations are further increased by a suitable choice of the

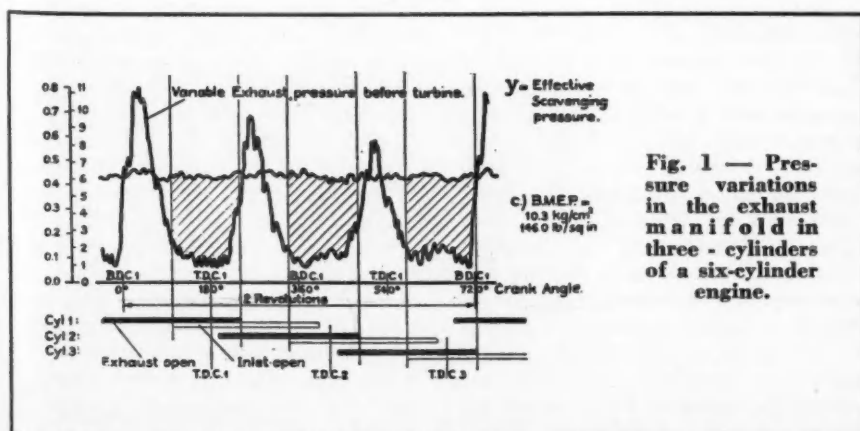


Fig. 1 — Pressure variations in the exhaust manifold in three-cylinders of a six-cylinder engine.

lengths and cross sections of the exhaust passages between engine and turbine. Fig. 1, herewith, shows the pressure variations in the exhaust manifold of three cylinders of a six-cylinder engine when operating at b.m.e.p. of 146 lb. per sq. in. The wavy, nearly horizontal line represents the blower pressure, and it will be seen that during the overlap of exhaust and inlet periods in any given cylinder the exhaust pressure is much lower than the blower pressure, so that scavenging can take place. Another chart accompanying the paper showed that in a constant-speed engine, as the load on the engine increases from 42 to 120 lb. b.m.e.p. the scavenging increases in a straight-line from 5 per cent to 40 per cent, whereas if the speed drops with increase in load (propeller load), the scavenging increases in straight-line relation from 10 per cent at 42 lb. to 33 per cent at 120 lb. b.m.e.p.

Exhaust Temperature Kept Down

One objection that is often made to supercharging of Diesel engines is that it increases the mean temperature of the cycle and adds to troubles due to heat stresses. Mr. Büchi claims that owing to the effective scavenging of his system, the cylinders are internally cooled and the volumetric efficiency is increased; besides, as the burnt gases are entirely swept from the engine, there will be more air in the cylinder for a given compression pressure and more fuel can be burned in consequence. The whole aim is to increase the mass of air used per cycle and to keep down the initial temperature, thereby making it possible to obtain a high specific output without resorting to the use of excessive pressures and temperatures.

In the discussion of this paper objection was made to the point that normal Diesel engines are capable of sustaining the higher explosion pressures due to supercharging, as if that were so, then larger cylinders could be put on the same base and crankshaft and the increase in output gained in that way. Mr. Magdeburger of the U. S. Navy said the Navy had declared the Büchi supercharger acceptable as equipment on engines offered to it. Doctor Moss congratulated Doctor Büchi on having succeeded in getting European builders of Diesel engines to adopt the supercharger, and he hoped that American manufacturers would follow suit. Mr. Nichols brought up the matter of costs. He had had a case where about 300 hp. more was wanted than the output of an engine which he was in position to supply, and the question then arose whether it was more advantageous to supply

the additional power by using a supercharger or by providing the engine with more cylinders. The original engine cost about \$20 per hp. and he figured that an engine of the same general type but increased cylinder number to supply the additional horsepower would have raised the cost in direct proportion, making the additional cost \$6,000. He had found that a Büchi supercharger suitable for the purpose would cost \$7,000 and the installation cost would add another \$3,000, so that from the original-cost standpoint the advantage was all on the side of the larger engine. Mr. Büchi in reply said that the quotation must have been wrong, as a supercharger for an engine of this size should not cost more than \$3,000.

Professor Lipetz, referring to this same matter, said that in many applications cost was not the only consideration, and that in transportation especially weight and space requirements were of equal importance. Reference had been made to the German high-speed trains which now attain maximum speeds of 126 m.p.h. In Germany a considerable number of both two-car and three-car high-speed trains are in service, and the three-car trains have the same Maybach engines as the two-car trains, but on the three-car trains the engine output is greatly increased by supercharging. This compactness and lightness of the powerplants has to be paid for. The objection was always made to supercharging that it increased the heat stresses as well as the mechanical stresses, but by the method employed by Doctor Büchi it was possible to keep down the pressure and temperature. He was quite familiar with the history of the development of the locomotive and

knew what a great advance had been made by the introduction of superheating, and he considered that the supercharging of the Diesel engines was a parallel to the use of superheated steam. In closing the discussion Doctor Büchi said the term supercharging as applied to his system was really a misnomer, as he achieved an increase of power primarily by scavenging, internal cooling, and restoring the quantity of the charge to the value which it would have except for throttling and heating effects on the way into the cylinder.

W. C. Keys, of Detroit, presented a paper on rubber springs in which he discussed the elastic properties of rubber in tension, in compression and in shear. Rubber, of course, is highly elastic in tension, its tension modulus for extensions within the range of 5 to 15 per cent elongation being of the order of 240 lb. per sq. in. of original section; yet it is rarely used in industry in that form, although it has been used for aircraft landing gears. Rubber is practically incompressible on a volume basis, but it is deformable and can be compressed along one axis by allowing it to bulge at right angles to this axis. Rubber in compression was widely used in the automotive industry for engine mounts before the present type of mountings, in which the rubber is placed in shear, came into use. When rubber is thus deformed by compressing it in one direction and allowing it to bulge, the material passes through a heat cycle, internal work being done, and a typical hysteresis curve for rubber in compression was given. The author also gave specifications for compounds suitable for rubber springs intended for different industrial purposes.

A New Book on Diesels

Diesel Engines, by P. E. Biggar, M.S.A.E., M.I.A.E. Published by the Macmillan Company of Canada, Toronto.

MR. BIGGAR, who is known to our readers through his contributions to our columns, has in the past been associated with Ricardo & Co. and with Leyland Motors, Ltd., in England, and has had extensive experience with Diesel engines of the automotive type. In his book he deals with principles and methods and with the practical operation of the engine. He outlines the history of the Diesel, which he regards as a logical development of the hot-air engine; enumerates its advantages and shortcomings, and then gives a simple explanation of the operating principles of the four-stroke Diesel

engine, the injection system, and the governor. Diesel fuels and combustion-chamber types are covered in separate chapters. Next follow chapters on engine operation and on the care of the injection system, and most of the remainder of the book is given over to different applications of the modern high-speed Diesel engine—automotive, stationary and marine. There is also a brief chapter on spark-ignition oil engines and in the final chapter the author takes a peep into the future and discusses future development. It should be pointed out that the book deals only with the high-speed or automotive-type engine. It is written in a very readable style and its mechanical get-up is excellent.

New DEVELOPMENTS

Automotive Parts, Accessories
and Production Tools

Car Heater

*Uses Molded Plastic Blowers
By Bishop and Babcock*

Two centrifugal type pressure blowers, molded of Durez plastic material, are said to provide large heat output and quietness for the new Duo Air-Stream hot water car heater made by Bishop and Babcock.

The molded fans are located on either side of the motor, which is mounted in the rear center, and draw air in from the sides and expel it through the radiator at the front.

Bearing

Unit Fan and Pump Shaft Bearing Improved by New Departure

A recent development by the New Departure Mfg. Co., Bristol, Conn., in the type of automotive fan and water pump mounting in which the impeller and fan are carried on a common shaft eliminates many small parts previously necessary, simplifies mounting, and is said to require little service of any kind.

In this design, the pump and fan shaft and supporting bearings are made in one compact unit. The shaft has the raceways for the two rows of balls formed integrally, thereby eliminating inner rings and keeping the bearing outside diameter correspondingly small.

The outer race is a solid steel cylinder fitted with permanent, close fitting seals at both ends.

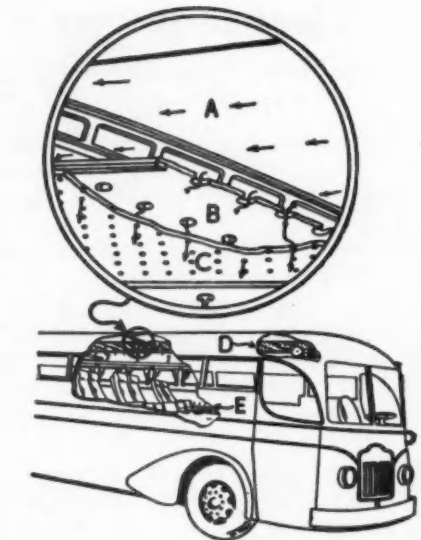
Sufficient space is allowed between the two rows of balls for a generous supply of lubricant, making provision for subsequent addition of grease unnecessary.

Bus Ventilation

*Burgess Acousti-Vent Equipment
Said to Eliminate Drafts*

One of the latest solutions to the problem of providing adequate motor bus ventilation without objectionable drafts is the Acousti-Vent equipment produced by the Acoustic Division of the Burgess Battery Co., Madison, Wis., which is a licensee under patents of the C. F. Burgess Laboratories, Inc., Chicago.

This equipment comprises a double ceiling installed under the bus roof. The lower ceiling is perforated with thousands of small openings and acts as a distributing member. The intermediate ceiling, made of a heavier ma-



Burgess bus ventilating system

plenum chamber into the lower air chamber immediately above the perforated ceiling. This is said to assure dispersion of the proper quantity of air through the perforated ceiling into the interior of the bus.

Details of the Burgess Acousti-Vent construction as shown in the illustration are as follows: A—plenum chamber under bus roof; B—intermediate ceiling with large openings; C—ceiling with small opening; D—dust filter for incoming air; E—exhaust grille at floor level.

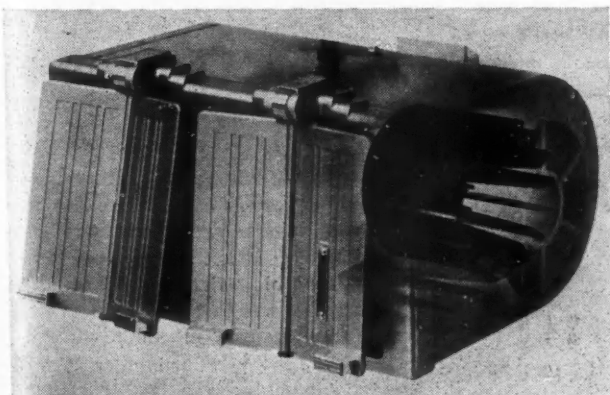
Assembly view of
Arens locking control.



Locking Unit

*Arens Device Automatically Locks
In Any Desired Position*

A new type of control device, which automatically locks in any position to which it is set, has been placed in production by Arens Controls, Chicago. As shown by the drawing reproduced herewith, a steel ball is used as a friction locking means. The control can be pulled out to any desired position, and it will stay there regardless of vibration. To release it, the little button in the center is pushed in. If it is desired to release the control rapidly, the button can be pushed forward with the palm of the hand. The locking force is varied by increasing or decreasing the pressure of the spring in the head assembly. This control is already in use on aircraft and would seem to be adapted also for automotive uses.



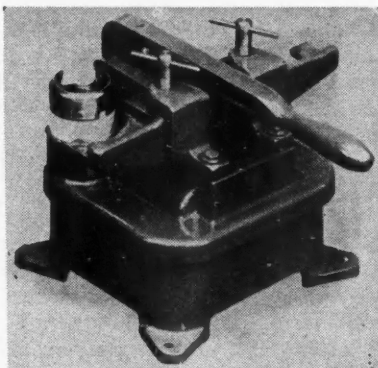
Bishop and Babcock hot water car heater

Electric Brazier

Saw Band Ends Joined By Grob Device

An electric brazier for brazing saw bands up to 1½ in. wide is now being manufactured by Grob Brothers, West Allis, Wis.

A transformer is mounted in the base and the terminals of the secondary coil are arranged on the cover to provide for clamping and proper alignment of the saw band ends to be joined. A center clamp for pressing the saw



Grob brazier

band ends together when brazed is operated with a handle.

The brazier is made for either 110 or 220 volt, single phase, 60 cycle, AC.

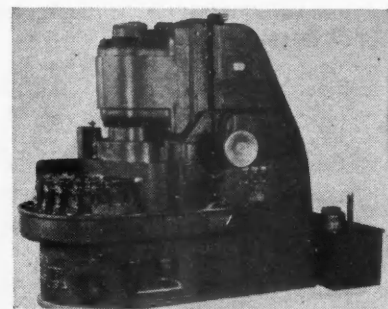
Surface Grinder

Hanchett Rotary Machine for Continuous Finishing of Work

The H. A. Hanchett Mfg. Co., Big Rapids, Mich., has developed a rotary surface grinder for continuous finishing of work. The machine illustrated is arranged for the continuous finishing of connecting rod bosses.

A one-piece column supports a vertical, motor-driven grinding head. Provision is made for down feed of the wheel head either by hand or automatically.

The grinding wheel, either of cylindrical or segmental type, is 20 in. in diameter and 3 or 4 in. high, with 2 or 3 in. face. The work table is 36 in. in diameter and has an infinite number



Hanchett surface grinder

of speeds ranging from ½ to 1½ r.p.m. This table can also be in the form of a 36-in. rotary magnetic chuck.

The coolant system comprises a Ruthman motor driven centrifugal pump mounted in an auxiliary tank having a capacity of 150 gal. Coolant is introduced to the grinding wheel and work at the center of the grinding wheel. Auxiliary nozzles direct coolant onto the work from the outside of the wheel.

All of the electrical controls are located within the column and built into the machine.

Remote Controller

Oilgear Instrument Simplifies Fluid Power Feed Application

The Oilgear Company, Milwaukee, Wis., announces a remote controller for new series fluid power feeds that's said to be simple, compact and positive. Mechanical control devices are eliminated and the application of fluid power feed greatly simplified. Hydraulic and electric devices have been conveniently and effectively combined so that machines

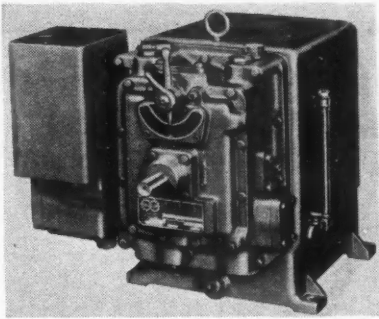


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Sedans, coupes, roadsters, trucks, busses—no matter what the automotive vehicle, there is a Mechanics Roller Bearing Universal Joint or Shaft Assembly for every requirement. Built as well as human experience and ingenuity can build, built by "Mechanics", these joints possess exclusive features and advantages which insure smooth running, promote long life and practically eliminate servicing. Mechanics Roller Bearing Universal Joints are simple, reliable, durable, and economical. All of their parts having any appreciable effect on balance are machined all over. Integral keys transmit driving torque. Ground pilots insure concentricity. Ample provision is made for easy lubrication. Assembly is simple. For the main drive, in steering gears, for driving air compressors, generators, fans—for every purpose that requires a universal joint "Make it a Mechanics Universal Joint". Investigate. Write, today, for complete information.

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Borg-Warner Corp. 1301 18th AVE., ROCKFORD, ILLINOIS



Oilgear remote control

can easily be controlled from a remote point.

In addition Oilgear offers a new remote control for the fine feed pilot valve on side of pump. Another unit provides remote control of the reverse function of mechanical control devices used in connection with feed pumps. An adjustable delayed reversal can be obtained when using this attachment and an electric time relay.

Fostoria Filter

Heavy-Duty Unit Added to Line of Coolant Filters

Announcement is made by The Fostoria Pressed Steel Corp., Fostoria, Ohio, of the addition of a new heavy duty unit to its line of Coolant Filters. It is known as the No. 12 Model and



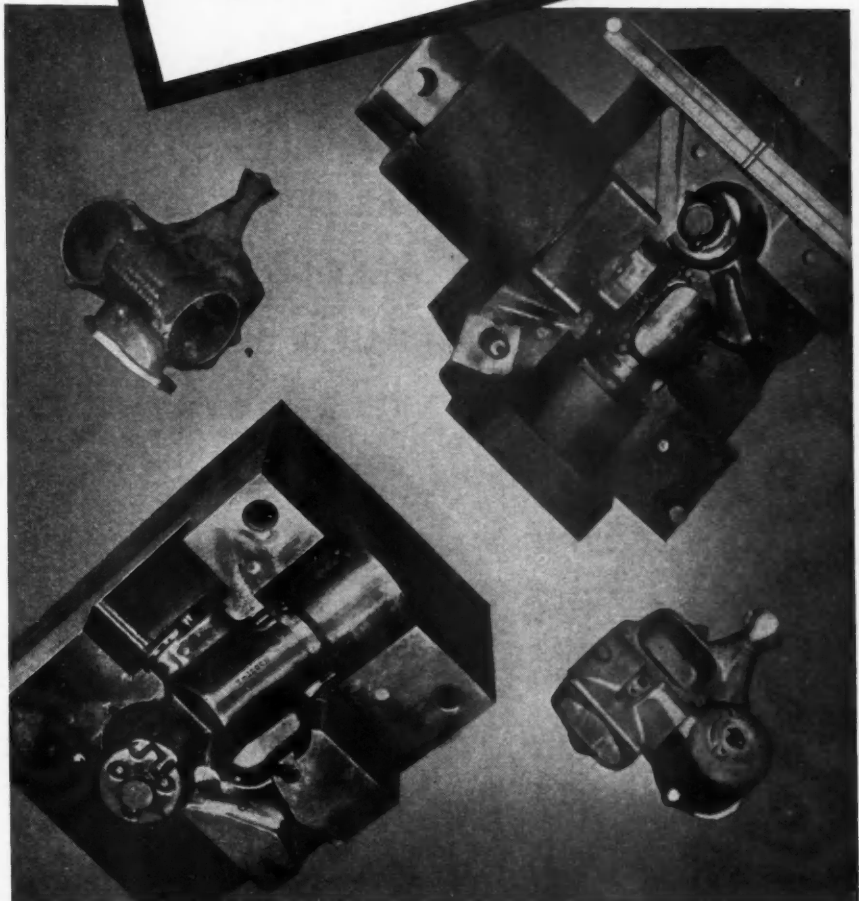
Fostoria filter

has a capacity 2 times larger than the No. 3 unit now in use. The new model has a filtering bowl approximately 13 ins. in diameter.

According to officials of Fostoria, the new job will be supplied ready for installation, being equipped with a floor stand and all necessary fittings for attachment to larger grinders.

Correction

On page 833 of the Dec. 12 issue of **AUTOMOTIVE INDUSTRIES** we published a description of the Oilgear horizontal broaching machine for broaching engine blocks. Due to a typographical error the production obtained with the machine was given as 10 blocks per hr. This should have been 60 blocks per hr.



UNRETOUCHED PHOTO OF DIES AFTER A RUN OF 3,000 CASTINGS

Marvel is an ideal steel for die casting aluminum and aluminum base alloys. In addition, it is used extensively for hot forming brass in both forging and pressing operations. A data booklet giving analysis, heat treatment, etc., is available for the asking.

VANADIUM-
ALLOYS STEEL CO. LATROBE, PA.



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**AUTOMOTIVE
INDUSTRIES**

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Volume 75**

July 4 to December 26

1936

THE CHILTON CO., INC., PHILADELPHIA

AUTOMOTIVE INDUSTRIES

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